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AGRICULTURAL RESEARCH INSTITUTE
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PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON.

1910, pp. 1–588.
(JANUARY—MARCH.)

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1910.

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PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

(January to April, 1910.)

◆

January 18th, 1910.

Prof. J. Rose Bradford, M.D., D.Sc., F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions made to the Society's Menagerie during the month of December 1909:—

The registered additions to the Society's Menagerie during the month of December were 90 in number. Of these 61 were acquired by presentation, 9 by purchase, 11 were received on deposit, 1 in exchange, and 8 were born in the Gardens.

The total number of departures during the month, by death and removals, was 171.

Amongst the additions special attention may be called to the following:—

One Long-eared Fox (*Otocyon megalotis*), from the Transvaal, presented by R. V. Doherty-Holwell, Esq., R.E., on December 22nd.

One Ælian's Wart-Hog (*Phacochœrus africanus*), from Nigeria, presented by Capt. H. Lloyd on December 22nd.

Eight Chestnut-breasted Ducks (*Querquedula castanea*), hatched in the Menagerie on December 11th.

One Green Viper (*Atheris chlorechis*), new to the Collection, from the Gold Coast, presented by Dr. H. G. F. Spurrell on December 23rd.

Mr. C. W. Beebe, Curator of Birds of the New York Zoological

Society, exhibited a series of lantern-slides made from photographs he had taken on a recent Natural History Expedition to British Guiana.

The following papers were read:—

1. Zoological Collections from Northern Rhodesia and adjacent Territories: Lepidoptera Rhopalocera. By S. A. Neave, M.A., B.Sc. Oxon., F.Z.S.

[Received November 9, 1909.]

(Plates I.–III.*, Text-figures 1 & 2, and a Map.)

The following paper is the first yet published, *in extenso*, of the collections of insects which I have had the opportunity of making during recent years in Northern Rhodesia and the Katanga Region of the Congo State. These collections were made on two separate expeditions. The first was during 1904 1906, when I was in N.E. Rhodesia as Naturalist to the Geodetic Survey, then in that country. A short account of the country traversed and of the vertebrates collected on that expedition has already been published in the Transactions of the Literary and Philosophical Society of Manchester, vol. 51, pts. I., II., III. etc. The country covered was the southern third of N.E. Rhodesia and the north-east portion of N.W. Rhodesia. The second expedition began early in 1907, and practically the whole of that year was spent in the Katanga region of the Congo State when I was Entomologist to the Katanga Medical Commission. The following year, 1908, was occupied in travelling over those northern portions of N.E. Rhodesia which had not been visited on my first expedition to that country. The areas covered by the two expeditions are therefore contiguous, comprising the whole of N.E. Rhodesia, the north-eastern portion of N.W. Rhodesia, and the south-eastern or Katanga Region of the Congo State.

The appended Map and Itinerary (see p. 5) will make clearer the relative positions of the localities visited. I have recently published † an account of this part of Africa, more especially in relation to the general features and geographical distribution. It will perhaps be of interest to add a few facts important from an entomological standpoint. As I have pointed out ‡, the country divides itself into three areas:—

(1) The low ground of the Zambezi basin, comprising chiefly the valley of the Zambezi itself and of its tributary the Luangwa.

Of this region, which is hot and low-lying, the chief characteristic is the very marked differences between the wet and dry seasons.

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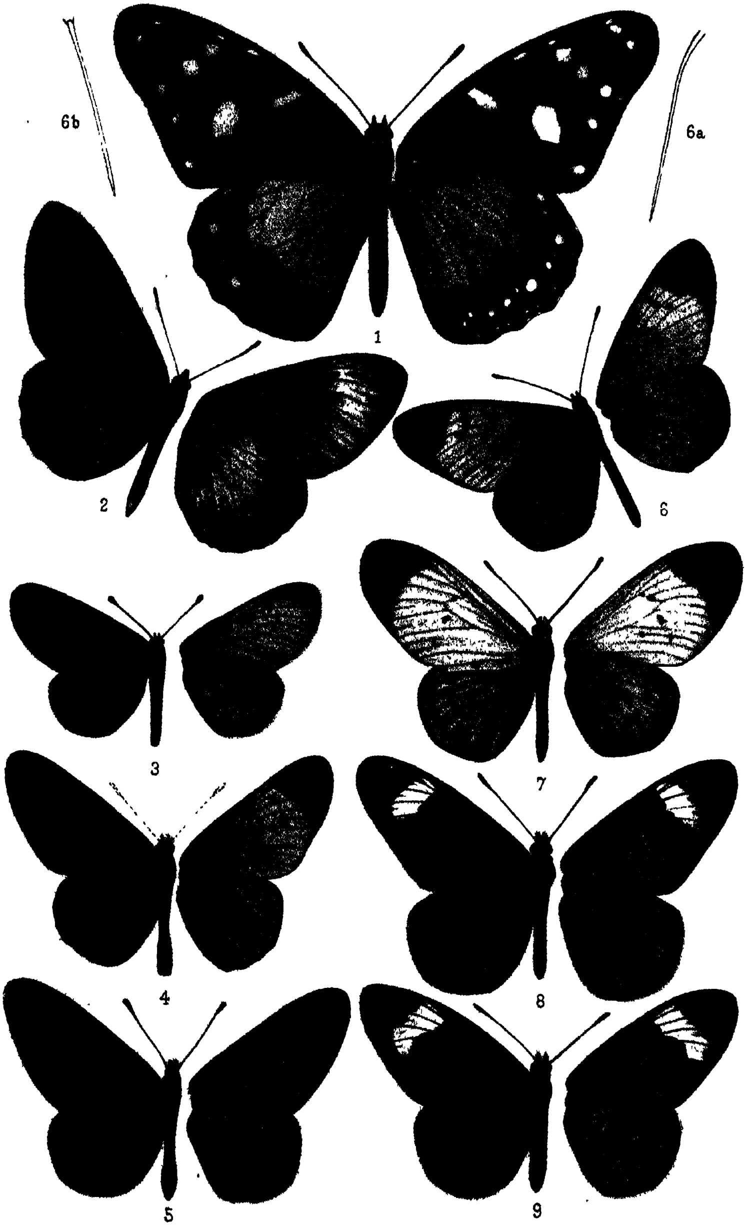
* For explanation of the Plates see p. 85.

† Geographical Journal, xxxv. p. 132.

‡ *Loc. cit.*

P.Z.S. 1910. Pl. I.



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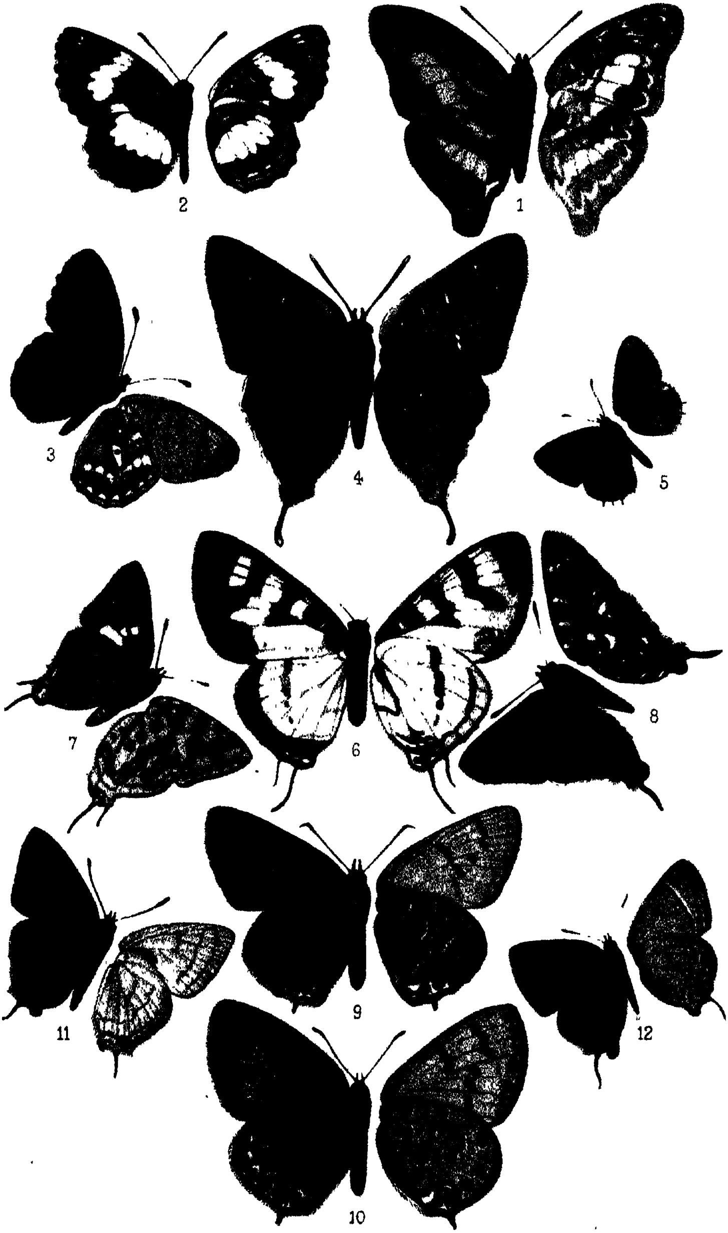
West, Newman chr

NEW OR LITTLE KNOWN BUTTERFLIES FROM NORTHERN RHODESIA &c

P.Z.S. 1910. Pl. II.



Horace Knight del et lith.
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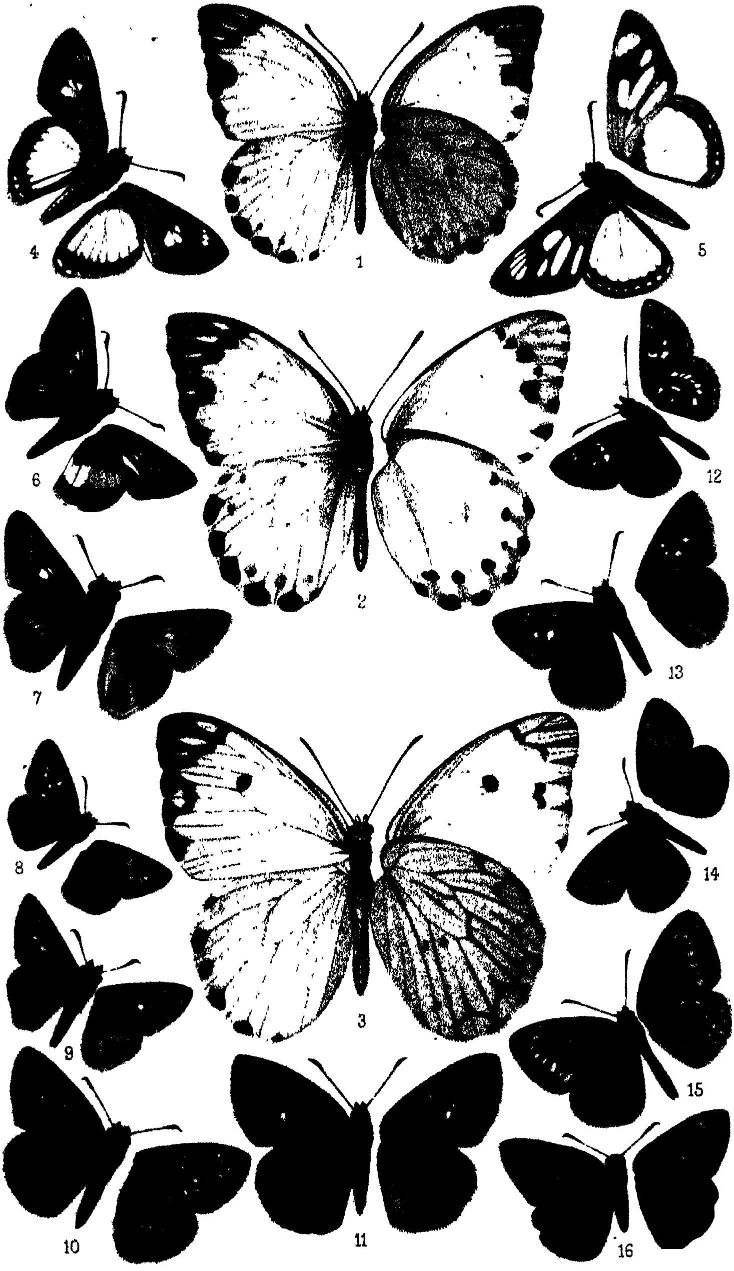
NEW OR LITTLE KNOWN BUTTERFLIES FROM NORTHERN RHODESIA &c.



Horace Knight del et lith
West, Newman chr

NEW OR LITTLE KNOWN BUTTERFLIES FROM NORTHERN RHODESIA &c.

The wet season in this valley, which has a comparatively small rainfall, lasts from November to the end of March. This state of things is accompanied by correspondingly marked seasonal phases in the butterflies. In addition to those genera in which it is to be expected, such as *Precis*, it is extremely noticeable among the Acræinæ. In a very large number of species inhabiting this valley, there is a marked tendency to a general dusky suffusion in the individuals of the wet phase, especially among the females. Dry season specimens, on the other hand, are very brilliantly coloured. During the dry season the climate of the Luangwa valley seems especially favourable to the Pierinæ, which are extremely dominant at that time. Indeed some species, such as *Pinacopteryx simana* Hopff., which I did not meet with elsewhere, were more abundant in thicket-covered country at that season than at any other time. One of the peculiarities of the Luangwa valley from a collector's point of view is the great scarcity of tropical forest, more or less thin woodland being however plentiful. Such forest as does occur is chiefly to be found in small patches on stream-banks at the foot of the Mchinga escarpment on the western side of the valley and in similarly broken ground on the eastern side in Portuguese territory. In these forest spots one finds species which are very rare or do not occur at all elsewhere in the valley. Among them may be mentioned *Euphædra neophron* Hopff., *Acræa cabira apecida* Oberth., *Melanitis libya* Dist., and, at the height of the wet season, *Liptena homeyeri* Dewitz.

The butterflies generally of the Luangwa valley are much the same as those of the tropical portions of S.E. Africa, though some of the coast species which occur on the lower Zambezi and in Nyasaland, such as *Amauris ochlea* Boisd., *A. niavius dominicanus* Trim., *Eronia buqueti* Boisd., etc., appear to be absent, and such species as *Pseudacræa lucretia* Cram. very rare.

(2) The second region comprises the whole of the high plateau country which forms the watershed between the Congo and the Zambezi, and includes isolated patches of elevated land in the Congo basin.

This country is characterised by its cool temperate climate and relatively less marked seasonal change. The rains tend to begin somewhat earlier and end later. One result of this is that the abundance of butterflies and other insect life, associated with the early spring in these regions, begins to be noticeable about the middle of September, some six or seven weeks earlier than is the case in the Luangwa valley. Indeed, it would appear that many Lycænidæ, more especially species of the genus *Aphnæus*, are on the wing only about this time.

There is a good deal of comparatively open country on this high ground. With it are associated certain butterflies, among which perhaps the more interesting are *Belenois picta*, here described for the first time, the rare *Papilio almansor* Honrath, and, in Katanga, the strangely coloured *Zeritis zorhageni* Dewitz. The remarkable

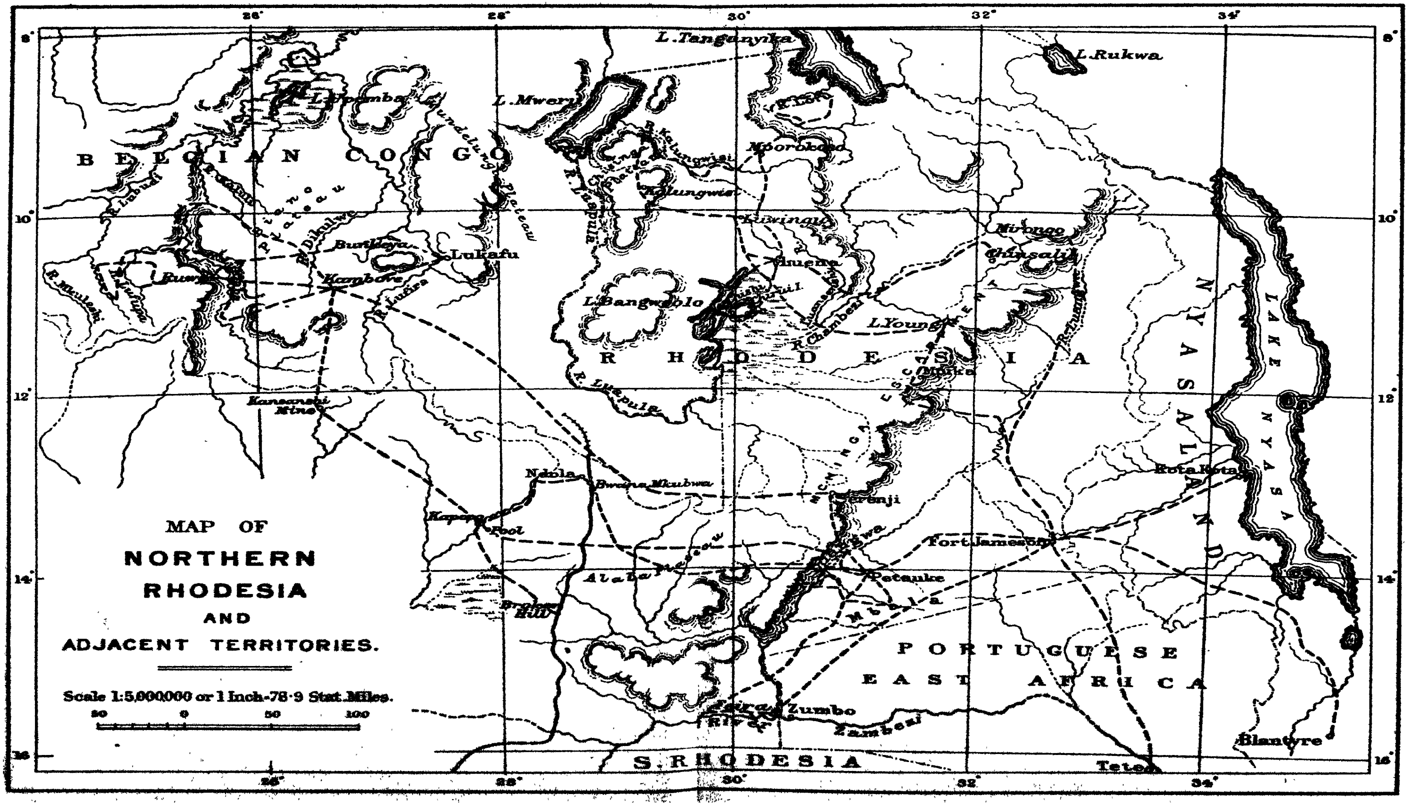
Acræa mirifica Lathy, recorded hereafter, frequents a special form of open country in the shape of marshes. Among the most interesting collecting grounds for the entomologist or naturalist are the patches of dense crowded forest trees, locally called "Msitu." These patches are of varying size, often very small, and are generally on the bank or source of a stream. They are seldom or never affected by the annual bush fires and are consequently the resort throughout the year of innumerable insects, many of which are peculiar to these spots. In Katanga, especially towards the west, even on fairly high ground, these forest patches are the home of several characteristically western genera, but this is hardly the case in those nearer the watershed, especially towards the east.

(3) Our third area comprises the low lying river valleys of the Congo basin. The banks of these rivers, after leaving the high ground, are covered with tropical forest, except in very flat countries. These spots are a paradise for entomologists, and swarm with butterflies of such tropical western genera as *Bicyclus*, *Pseudoneptis*, *Diestogyna*, *Euphædra*, *Euryphene*, *Harma*, etc., etc. This was especially noticeable in the valley of the Lualaba river and to the west of it. I also found many of these forms in the lower Kalungwisi valley in N.E., Rhodesia. Unfortunately, I was not able to visit either spot in the height of the rains, which appears to be the richest season in these localities.

The collection here described contains 450 species, distributed among the families as follows:—

NYMPHALIDÆ.	*Danainæ*	6
	Satyrinæ	27
	Acræinæ	46
	Nymphalinæ	93
LEMONIIDÆ		1
LYCÆNIDÆ		120
PIERIDÆ		42
PAPILIONIDÆ		15
HESPERIIDÆ		100
	Total	450

The unusually large proportion of Lycænidæ and Hesperiidæ, which, as may be seen, comprise about half the total, is due to the fact that an attempt was made to give an equal amount of time to collecting all the subfamilies. It seems to have been largely the practice of collectors in the tropics to sacrifice these more inconspicuous forms for those more attractive to the eye. No attempt has been made to record the actual number of specimens captured except in the case of new or rare species. The number of specimens of Lepidoptera brought to England, approximately, was about 25,000. Very large numbers also of commoner species were discarded before the collections came to England. The



MAP OF

NORTHERN RHODESIA

AND

ADJACENT TERRITORIES.

Scale 1:5,000,000 or 1 Inch-78·9 Stat. Miles.

collections were all made by myself or by youthful native assistants under my direction.

The following list of species has been arranged as far as possible according to Professor Aurivillius' great work, 'Rhopalocera Æthiopica.' I have therefore not thought it necessary to give the references or synonymy of species except in the case of those described since the publication of that book, or where some change in the nomenclature seems desirable. In the case of the skippers I have given references only to those species not mentioned in Dr. Holland's paper in these 'Proceedings' for 1896.

The Roman numerals, frequently placed after the locality, refer to the months of capture. In the descriptions of new species the veins are counted from the hind margin to the costa, the first submedian always being vein 2. The descriptions of the markings begin, as far as possible, at the base of the costa and end at the outer margin.

The measurements given are the greatest length of the primary from the middle of the base to the tip.

In the laborious work of identifying so large a number of species I am very greatly indebted to the following friends for their kind assistance: Mr. G. T. Bethune-Baker, Dr. F. A. Dixey, Mr. Hamilton H. Druce, Mr. F. A. Heron, Dr. Karl Jordan, Mr. G. A. K. Marshall, and finally Mr. Roland Trimen, F.R.S., who has been so kind as to advise and assist me on many points throughout the paper.

I also owe much to the authorities of Magdalen College, Oxford, who, by means of a generous grant, enabled me to spend in Oxford the several months necessary for the production of this paper. The bulk of the collection remains in the Hope Collection at Oxford, where many of the specimens were set and most of the systematic work done. For this I am greatly indebted to the kindness of Professor E. B. Poulton, F.R.S.

The following Itinerary gives a list of the places visited during the two expeditions.

FIRST EXPEDITION (1904 to 1906).

1904. Feb. 22-28. Chinde to Tete.
Feb. 29-Mar. 12. Tete to Fort Jameson, N.E. Rhodesia.
Mar. 13-April 18. Fort Jameson. 4000 feet (rainy season).
April 19-May 6. Fort Jameson to Feira at the junction of the Luangwa and Zambezi rivers (end of rains).
May 7-Oct. 20. Mid-Zambezi and lower Luangwa valley. 1200-1500 feet (dry season).
Oct. 21-Nov. 9. Up mid-Luangwa valley, Feira to Petauke (beginning of rains).
1905. Nov. 10, 1904-April 26, 1905. Petauke, east side of Luangwa valley. 2400 feet (wet season).

1905. April 27–May 20. Mbala Country, S.E. of Petauke. 3500 feet.
May 21–Aug. 31. Low ground in Luangwa valley. 1400 feet (dry season).
Sept. 1–10. Petauke to Lukashashi River.
Sept. 11–15. Edge of Mchinga escarpment to Mkushi. 4000 feet.
Sept. 16–Oct. 13. Ndola and district, N.W. Rhodesia. 4000 feet (early spring).
Oct. 14-28. Upper Kafue valley and Kapopo. 4000 feet.
Oct. 29–Nov. 24. Eastward across southern Serenji district to edge of Mchinga's (beginning of rains).
1906. Nov. 25-Jan. 6. Petauke and district.
Jan. 7-14. Petauke to Fort Jameson.

SECOND EXPEDITION (1907 to 1908).

1907. Jan. 4-12. N.W. Rhodesia, Broken Hill to Kapopo, upper Kafue. 4000 feet (wet season).
Jan. 13-28. Kapopo to Kansanshi. 4999 feet.
Jan. 29-Feb. 3. Kansanshi to Kambove, Congo Free State.
Feb. 4–Mar. 18. Kambove. 4500 feet.
Mar. 19-April 7. Upper Dikulwe valley. 3500-4000 feet.
April 9-16. High plateau between valleys of Dikulwe and Lualaba. 4500 feet.
April 17–May 13. Low ground in valley of Kaluli and Lualaba rivers. 2500-3500 feet (end of rains).
May 14-31. Upper Lualaba valley, high plateau. 4000 feet.
June 1-9. Upper Lualaba to Kambove.
June 10–28. Upper Lufira valley, 3500 feet.
June 29-July 16. Kambove.
July 17-24. Kambove to Lukafu, mid-Lufira valley. 3000 feet.
July 28-Sept. 18. Bunkeya. 3000 feet.
Sept. 19-27. Bunkeya to Ruwe.
Sept. 28-Oct. 17. Upper Lufupa river. 3500-4000 feet.
Oct. 18-23. Upper Lubudi river. 3500 feet (early spring, first sign of the rains).
Oct. 24–31. Upper Lufupa river.
Nov. 1–6. Lower Lufupa to Ruwe.
Nov. 7-18. Ruwe to Kambove.
Nov. 19-Dec. 12. Through eastern Katanga, south of bend of Luapula to English boundary, Serenji district, N.E. Rhodesia.
Dec. 13-30. Serenji district. 4500 feet.
1908. Dec. 30, 1907–Jan. 2, 1908. From edge of Mchinga's across Luangwa to Petauke.
Jan. 3-13. Petauke.

1908. Jan. 14–21. Petauke to Fort Jameson.
Jan. 22–Feb. 6. Fort Jameson.
Feb. 7–Mar. 31. Up mid- and upper Luangwa valley to Mirongo. 1500–2000 feet (height of rains).
April 1–12. Up Mchinga escarpment to Chinsali and district. 4500 feet.
April 13–May 20. Mid-Chambezi valley. 4000 feet (end of rains).
May 21–26. Chambezi to Luena.
May 27–June 20. Luena district and eastern shore of Lake Bangweolo.
June 21–July 9. Chishi, Mbawala, and Chirui Islands on Lake Bangweolo. 3900 feet.
July 10–22. Luwingu district. 4300 feet.
July 24–31. Luwingu to Mporokoso. 4500 feet.
Aug. 1–10. Upper Lofu valley. 4000 feet.
Aug. 11–17. Lower Lofu valley. 3000–3500 feet.
Aug. 18–27. High plateau between Lofu valley and Lake Tanganyika. 4000–5000 feet.
Aug. 28–Sept. 3. Mporokoso.
Sept. 4–10 Upper Kalungwisi valley.
Sept. 11–17. Lower Kalungwisi valley.
Sept. 18–26. High plateau, Kalungwisi district.
Sept. 27–Oct. 1. Luwingu.
Oct. 2–23. Luwingu to mouth of Chambezi.
Oct. 24–Nov. 5. Mouth of Chambezi to Mansya river and Lake Young. 4500 feet.
Nov. 6–9. Lake Young to Mpika.
Nov. 10–23. Mpika to Fort Jameson. (First rains.)

Fam. NYMPHALIDÆ.

Subfam. DANAINÆ.

LIMNAS CHRYSIPPUS L.

A common insect everywhere but prefers open country and avoids very dense forest. The specimens are mostly of the type form with occasional individuals tending to var. *alcippus* Cram. I saw one specimen of the *dorippus* Klug form in the mid-Chambezi valley in May, and found it not uncommon a few miles above the mouth of the Lofu river, near Lake Tanganyika, but did not meet with it to the south of these localities.

TIRUMALA LIMNIACE PETIVERANA Dbl. & Hew.

Occurs over the whole area except in the Zambezi valley, but is nowhere a common insect so far as my experience goes.

AMAURIS NIAVIUS L.

Sparingly in dense forest on the Lualaba river, iv. and v., and in similar localities on the Kalungwisi river, ix.

Amauris psyttalea Plötz.

This species is represented by two males only, one from near Chensali, iv., and the other from the Lofu river, near Lake Tanganyika, viii.

Amauris hyalites dannfelti.

Amauris dannfelti Auriv. Ent. Tidskr. xii. p. 196.

A common insect in more wooded localities in Katanga and in the northern portion of the plateau country in N.E. Rhodesia. The transparent spots of the primary, due perhaps to their more or less green background in nature, look pale green on the wing. I incline to the view that species of this type of *Amauris* rather than *Tirumala petiverana* have been the primary model of *Papilio leonidas* Fabr.

Amauris lobengula katangæ, subsp. n. (Plate I. fig. 1, ♂.)

Most nearly allied to *A. lobengula whytei* and *A. lobengula crawshayi* Butler. It differs from these in the colour, size and distribution of the ochreous area on the secondary. In *katangæ* this band of a deep ochreous colour is very broad, reaching, especially toward the inner margin, beyond the end of the cell. In contrast to its width, it extends as a very narrow tongue up to the middle of the costal margin, nearly, and in some specimens quite as narrow as in typical *lobengula* and very much narrower than in either of the two subspecies above quoted. The spots of the primary are pure white, thus agreeing with *A. l. crawshayi*, but in this case *katangæ* is easily distinguished by the dark colour of its secondaries. In the primary the spot in the cell and discal spot in area 2 are very large and well marked, more so than in any of the allied species. The female is a little larger than the male, but does not otherwise differ.

Length of primary 42 mm.

Type in British Museum.

11 males, 2 females, Kambove, Katanga, 7-27.ii.07.

This species frequents well wooded localities and does not differ from other species of *Amauris* in its habits.

Subfam. SATYRINÆ.

Melanitis leda L.

A common forest insect throughout the country. As has been noted by other observers, it has, when settling on the ground, a habit of sitting aslant among dry leaves, etc.—which increases the difficulty of detection. Both species of *Melanitis*, more particularly the species next referred to, are addicted to taking a flight in the open just before sundown.

Melanitis libya Dist.

Also a common insect, in the Luangwa valley at least, frequenting the same localities as the foregoing, but it is not quite so universally distributed. Has the same habits and is on the wing all the year.

GNOPHODES PARMENO Dbl. & Hew.

A common forest insect in the lower ground of the Congo basin. It has much the same habits as a *Melanitis*.

BICYCLUS SEBETUS Hew

Not uncommon in the forests in the river-valleys of the Congo basin. It is on the wing all the year and is a difficult insect to catch in dense vegetation as it is very wary. It almost invariably settles on the ground, where it is extremely difficult to see. It seems, nevertheless, to be not infrequently attacked by lizards, which are common in these forest areas in the Congo basin.

MYCALESIS DUBIA Auriv.

Represented in the collection by two males from the Lubudi river, x.

MYCALESIS AURICRUDA Butler.

I took two males and one female of this species on the Lubudi river, x. It frequents dense forest.

MYCALESIS SANDACE Hew. ?

I took a few specimens of a *Mycalesis* which I refer with some hesitation to this species. It occurs sparingly throughout Katanga and N.E. Rhodesia west of the Mchinga escarpment.

MYCALESIS ENA Hew.

Occurs throughout the area under consideration, being especially common in the Luangwa valley. Dry-season specimens are scarce but were taken from April to June.

MYCALESIS SOPHROSYNE Plotz.

Five males and one female from the Lufupa and Lubudi rivers, ix. and x. All dry-season forms.

MYCALESIS SELOUSI Trim.

A common insect throughout the country especially in the dry season. I also took in various localities what I believe to be the wet-season form of this species. It is a smaller insect with well-marked eye spots on the underside, and with the same waved transverse line across both wings which is characteristic of typical *selousi*. It is on the wing from January to March, whilst *selousi* occurs from March onwards throughout the dry season.

MYCALESIS SAFITZA Hew.

A common insect everywhere but scarce in the height of the dry season.

MYCALESIS ANYNANA VICARIA Thurau.

Mycalesis vicaria Thurau, Berl. Ent. Zeit. xlviii. 1903, p. 118.

Not uncommon in the Luangwa, Chambezi, and Lofu valleys at all seasons.

? **MYCALESIS VULGARIS** Butler.

Occurs sparingly but in a good many localities west of the Mchinga escarpment.

MYCALESIS NEBULOSA Feld.

Two specimens only, both from the valley of the Lualaba river, one v., the other x. It frequents dense forest.

MYCALESIS SAUSSUREI Dewitz.

I captured seven individuals of this species on the Lufupa river, x. They all differ somewhat from specimens from further north. The white band across both wings on the underside is broader and more distinct, but in spite of this is barely visible on the upper surface. A forest species.

MYCALESIS COOKSONI Druce.

Mycalesis cooksoni Druce, Trans. Ent. Soc. 1905, p. 251, pl. xiii. fig. 1.

I took a few individuals, which I attribute to this species, in patches of forest on the Lofu and Kalungwisi rivers.

MYCALESIS spp. ?

There are also two other species from several localities allied to the foregoing and to *danckelmanni* Rogenh.* They appear to be new, but it seems to me inadvisable to describe them in the present confused state of the whole genus.

MYCALESIS HAROLDI.

Mycalesis haroldi Druce, Trans. Ent. Soc. 1905, p. 252, pl. xii. fig. 2.

I captured two males and one female of this striking species on the Lufupa river, x. and xi.

HENOTESIA PERSPICUA Trim.

This species is common everywhere. As Marshall † has already pointed out, *H. simonsi* Butler is probably the dry-season form of this species. I found typical *simonsi* only in the very hot and dry river-valleys of the Luangwa and the lower Lofu near Lake Tanganyika. On the high plateau generally of N.E. Rhodesia and throughout Katanga the extreme dry-season specimens are somewhat intermediate between *perspicua* and *simonsi*.

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* Ann. Hofmus. Wien, vi. p. 462, pl. 15. fig. 9 (1891

† Trans. Ent. Soc. 1896, p. 562.

HENOTESIA PHÆA Karsch.

I took this somewhat uncommon species over a wide area in Katanga but nowhere very commonly. It was also not uncommon in the thickets on the shores and islands of Lake Bangweolo, vi. and vii.

PHYSCÆNEURA PIONE Godm.

A not uncommon insect in woodland (not forest) country over a wide area. It is only on the wing during the wet season and has a strangely feeble flight.

NEOCŒNYRA BERA Hew.

A rare insect in my experience, occurring sparingly in the Luangwa valley only, during the rainy season.

NEOCŒNYRA GREGORII Butler.

Represented only by two individuals captured on wooded hills near Fort Jameson, iii., and by two others from similar localities on the upper Chambezi river, iv.

NEOCŒNYRA COOKSONI.

Neocœnyra cooksoni H. H. Druce, Trans. Ent. Soc. 1907, p. 77, pl. ii. fig. 1.

A common insect during the wet season in Katanga but not met with elsewhere. It is a woodland species.

YPTHIMA PUPILLARIS Butler.

? = *impura* Elwes & Edwards.

A very long series, taken at all seasons and in all localities, of what appears to be this species. It seems to pass by insensible gradations into individuals which correspond to the description of *impura* * Elwes & Edwards.

YPTHIMA ITONIA Hew.

This species is ubiquitous and is on the wing throughout the year.

Subfam. ACRÆINÆ.

PARDOPSIS PUNCTATISSIMA Boisd.

Fort Jameson, Luangwa and Chambezi valleys, i. to iv.

I took this species sparingly in the above localities in the wet season. It seems nowhere abundant and disappears apparently towards the west, as I did not meet with it in Katanga. It frequents woodland and has a weak floating flight.

ACRÆA NEOBULE Dbl. & Hew.

This seems a common species everywhere and I took it at all seasons. It prefers woodland but sometimes comes out into the open. It flies very high for an *Acræa* and may often be seen sailing to and fro over the same spot some 10–12 feet from the ground.

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* *Y. impura* Elwes & Edwards, Trans. Ent. Soc. 1893, p. 23, pl. 3. fig. 48.

ACRÆA ZETES L.

I found typical *zetes* common in Katanga, iii. to v., and again, x., xi. In Northern Rhodesia I took only a single male, viii., on the high plateau country to the south of Lake Tanganyika.

ACRÆA ZETES ACARA Hew.

I found this form replacing the typical one in the Lake Bangweolo district, Chambezi and Luangwa valleys, and the districts of the upper Kafue in N.W. Rhodesia. It seems to frequent rather more open country than the type form, which affects rather dense woodland or forest. It occurs at all seasons.

ACRÆA ASTRIGERA.

Acræa astrigera Butler, P. Z. S. 1899, p. 421, pl. xxv. fig. 5.

I met with a few individuals of this species on the Mansya river near Lake Young at the beginning of November, 1908.

ACRÆA ANEMOSA Hew.

A common insect during the wet season in the Luangwa valley. West of the Mchinga escarpment I took only two specimens, viz., in the Broken Hill district, ix. and xi. Both these approach the *arcticincta* form of Butler and have the spots of the fore wing much enlarged. To the north and west of these localities *anemosa* appears to be replaced by the next species. It has a very lazy flight and is easily captured. It frequents woodland.

ACRÆA WELWITSCHI Rogenh. (Plate I. fig. 2, ♂.)

I first met with this little-known insect on the upper Kafue river, N.W. Rhodesia, in October 1905, but took only a single female. Subsequently in Katanga I took four males on the Lualaba river. v., and a worn female on the Lubudi river, x. Eventually in 1908 I found it swarming in the Lake Bangweolo district, a new brood having obviously just emerged about the middle of June. I continued to take many specimens, some much worn, in the Kalungwisi and Lofu river valleys up to the middle of September. Strange to say, females appeared to be very rare amongst this dry-season brood until the end of September and during October. when all of the few individuals captured were females.

This large *Acræa* with its brilliant cerise coloration and heavy black margins is an extremely conspicuous object on the wing. It seems, as I shall endeavour to show later, to have influenced the pattern of other Acræas in the same neighbourhood.

As the species is so little known in collections and the male seems to be undescribed, it is perhaps as well to give a full description of it. The males vary a good deal especially in the black suffusion over the wings.

The male genitalia, though of the same character as those of *anemosa*, are much smaller and more slender.

UPPERSIDE.—*Primaries.* The entire base, including the proximal half of the cell, black. The costa narrowly black. A moderately broad black apex narrowing rapidly as it approaches the posterior angle. A narrow black discocellular streak. A little beyond end of cell a black band of confluent spots extending from costa to second submedian. Sometimes a separate spot in area 3. A well-defined spot in 2 immediately below extremity of cell. A small paired discal spot (sometimes two pairs) in 1. Ground-colour bright cerise, sometimes becoming orange-ochre toward apex and outer margin.

Secondaries. The base broadly black, but more or less covered with scattered whitish hairs, a broad black outer margin inwardly somewhat serrated; ground-colour as fore wing, sometimes a trace of four or five small black spots around extremity of cell.

UNDERSIDE.—*Primaries* as upperside, but black of apex and outer margin narrower; a small greenish-white spot at base of costa; apex flushed internally with whitish and marked with ochreous submarginal internervular streaks. Ground-colour paler.

Secondaries. Black base encloses five to seven small greenish-white spots; three such spots along narrowly black inner margin; a streak of same colour follows outline of anal angle; black outer margin encloses seven small greenish-white spots (paired in 1 *c*); discal area pinkish-white outlined along its basal inner and outer marginal edges with somewhat arrow-shaped internervular spots of brick-red colour.

Fringe of both wings black with internervular patches of white.

Palpi ochreous; *thorax* black; *abdomen dorsally*, black except last three segments which are ochreous; *laterally*, ochreous; *ventrally*, narrowly black enclosing some whitish spots.

Length of primary 34 mm.

The female, already described by Rogenhofer, differs chiefly in reduction of the black basal area which, in secondaries at least, is nearly absent, and in the ochreous, not cerise, ground-colour of primaries. The female abdomen is deep ochreous with laterally placed white spots and is nowhere black.

ACRÆA EGINA Cram.

I took this insect sparingly on the upper Kafue river in October and on the Lualaba river in April and May, but found it common in the Lake Bangweolo district in June and July, especially on the islands in that lake. It also occurred in the Kalungwisi and Lofu river valleys in August and September. These specimens exhibit characters somewhat intermediate between the type form and *areca* Mab. The majority have more or less well-developed scarlet internervular streaks in the apical and outer-marginal portions of the primaries. I found this insect, which is very brilliant on the wing, to have a very powerful flight and to be somewhat less easy to catch than most Acræinæ. It frequents the neighbourhood of rather dense forest or thickets.

ACRÆA PERENNA Dbl. & Hew.

This species is represented in the collections by a single male from the Lufupa river, x.

ACRÆA CEPHEUS L.

A single female captured on the same day and in the same place as the last species.

ACRÆA BÜTTNERI.

Acræa büttneri Rogenh. Ann. Hofmus. Wien, iv. p. 553, pl. 23. fig. 8.

Of this somewhat rare species I took five specimens at Kansanshi, N.W. Rhodesia, i., and four more on the Lufupa and Lubudi rivers, x. I did not observe it elsewhere. It is a woodland species somewhat resembling, on the wing, *atolmis* Westw., especially the wet-season form of that species.

ACRÆA VIOLARUM ASEMA Hew.

Not uncommon in the Fort Jameson district and on the Broken Hill plateau. It prefers open country and seems to avoid the low-lying Luangwa valley. The above localities appear to be the northern limit of its range, as farther north it is replaced by the next subspecies. At Ndola, N.W. Rhodesia, 21 & 23.ix.05, I captured one specimen of each form.

ACRÆA VIOLARUM OMRORA.

Acræa omrora Trim. P. Z. S. 1894, p. 24 note.

Acræa asema Trim. P. Z. S. 1891, p. 68, pl. 8. figs. 9, 10, 10*a*.

Acræa violarum umbrata Wichgraf, B. E. Z. liii. p. 242, pl. vi. figs. 5, 6 (1908).

This is a fairly common species throughout the year on the high plateau of N.E. Rhodesia from the Serenji district northwards, and also occurs, but less commonly, in Katanga. The specimens recently figured by Wichgraf under the name *umbrata* * are wet-season specimens and much more heavily marked than the dry-season ones. A long series taken at all seasons, however, makes it highly improbable that they are distinct species.

ACRÆA MIRIFICA. (Plate I. fig. 3, ♀.)

Acræa mirifica Lathy, Trans. Ent. Soc. 1906, p. 2, pl. i. fig. 2.

I found this highly remarkable species not uncommon but extremely local on the higher plateau country from Serenji to Lake Bangweolo. It seems to be entirely confined to patches of marshy ground generally marking the sources of streams and well described as "sponges" by Livingstone in his Last Journals. This insect has a very weak flight, but is extremely tough and when pinched between finger and thumb exudes a pale green fluid.

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* *Loc. cit.*

The males of this species, of which I have taken over sixty individuals, all differ from the figure of the type by the possession of a row of seven minute internervular marginal red spots on both sides of the outer margins of the primaries, and by the absence of white submarginal spots on the upperside of the secondaries. The band on the primary is also pale golden, not whitish.

Another specimen, however, which I have had an opportunity of examining in the Tring Collection, from the same locality as the type, viz. Bihe, Angola, agrees in the main with my specimens. We must, therefore, conclude that the type specimen is a somewhat abnormal one.

The females, which are somewhat variable, differ greatly from the males, especially on the upper surface.

♀. UPPERSIDE.—*Primaries.* Ground-colour pale golden, more or less suffused towards base with dusky scales; base of costa red becoming orange towards apex; a narrow black apex and a narrow line of black on outer margin enclosing seven minute internervular brick-red spots as in the male. A spot in middle of cell and a well-marked discocellular spot; immediately below another spot in area 1 *b*. In some specimens there are also submarginal spots in areas 3, 2, 1, of which that in 2 is placed near the median nervure.

Secondaries. Ground-colour as primaries with a well-defined medium black margin, some of underside spots represented, especially discocellular and four spots around end of cell.

UNDERSIDE.—*Primaries* as upperside but ground-colour somewhat more fulvous; black apex reduced; inner portion of apex and whole of *secondaries* have the same shining golden ground-colour as the male. Other markings of secondaries as in male.

Fringe of primary dusky, of secondary pale golden; *palpi* ochreous; *vertex* and anterior portion of *thorax* bright red; *abdomen*, above, black marked laterally with a row of small red spots, below, ochreous marked black and red in mid-ventral line.

The relationship of this peculiar species to other Acræinæ is of considerable interest. In the first place, the rudiment of a third internal nervule on the secondaries is well-marked for three-quarters of its distal portion, only fading away as it reaches the base. The somewhat long hairs which are placed upon all the nervules on the under surface are also distinctly visible. The general resemblance of the female of the above described species to *A. anacreon* Trim. and its allies led me to examine them also. I find this nervule to be well-marked in *anacreon* Trim., *induna* Trim., *bomba* Grose-Smith, and *wigginsi** Neave, and a distinct trace of it in *violarum* Boisd. and its forms. This character seems to be absent from all other Ethiopian or Oriental Acræinæ, though traces of it frequently remain in the pattern usually as a paired spot on the margin. In *Planema* the former presence of this nervule is indicated by a *double* internervular streak in area 1 *c*.

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* *Acræa wigginsi* Neave, Nov. Zool. xi. p. 326, pl. i. fig. 3 (1904).

On turning to the South American genus *Actinote*, I was extremely interested to find that this nervule is more or less well represented in all the species that I examined. Further, an examination of the tarsus of the fore-leg showed that in *mirifica*, though there are traces of two tarsal joints compared with one in *Actinote*, they are very much more stunted than in other African Acræinæ, including *anacreon*. In addition to the above anatomical characters, we have the fact that the male of *mirifica* is, on the upper surface, extremely like an *Actinote* both in pattern and coloration. It is perhaps, therefore, fair to suggest that this interesting species possibly represents a link between the Acræinæ of the Old and New Worlds.

ACRÆA INDUNA Trim.

I took this species in fair numbers in many localities, especially where there were large stretches of woodland. It was particularly common in the Chambezi valley and Lake Bangweolo district in May and June. It is on the wing at all seasons except apparently during the height of the dry season in August and September, though usually found sparingly even then.

The wet-season females of this species also exhibit a tendency to general duskiness.

Until more evidence is forthcoming this species should, I think, be kept distinct from *A. bomba* Grose-Smith.

ACRÆA ACRITA.

Acræa acrita Hew. Exot. Butt. *Acræa*, pl. iii. fig. 18.
Acræa ambigua Trim. P. Z. S. 1891, p. 70, pl. ix. fig. 11.

Some confusion among systematists seems to exist with regard to this striking and variable species, more especially between its seasonal phases and geographical races.

A very long series, taken on a wide area, demonstrates the existence of two well-marked geographical races.

(1) *Acræa acrita acrita* Hew.

The typical form is the Eastern race of this species, characterised by having a narrow black apex to the primary from 2–4 rarely 5 millimetres wide. The spots on primaries are always well developed. My series of this form, 120 specimens, comprises every gradation between the extremely brilliant dry-season specimens and the melanic wet-season ones. Extreme examples of the wet phase are on the upper surface more or less uniformly dusky in the female, while the male has the greater portion of the secondaries suffused with coal-black, contrasting greatly with the brilliantly coloured primaries.

Thurau figures a male of the wet-season phase of this race in the B. E. Z. for 1903, p. 129, pl. ii. fig. 8 as var. *aquilia*, and the underside of an extreme dry-season specimen is well figured by Trimen, P. Z. S. 1894, pl. iv. fig. 4.

I took this form sparingly in the Broken Hill district, and commonly in the Luangwa and Chambezi valleys. To the west of these localities, as we shall see, it is replaced by another race. The typical form of *acrita* appears to extend up the eastern side of Africa from the Transvaal to a little north of the latitude of Mombasa.

(2) *Acræa acrita ambigua* Trim. P. Z. S. 1891, p. 70.

This appears to be the western or perhaps central race of the species. My collection contains a long series, some 105 individuals, captured in the Bangweolo, Mweru and Tanganyika districts and less commonly in Katanga. This race is characterised by the breadth of the black apex to the primaries, normally 6 7 mm. wide, and by a number of other characters already pointed out by Mr. Trimen (*loc. cit.*). Mr. Trimen has kindly allowed me to examine the male mentioned by him (*loc. cit.* p. 71) as captured by Mr. Selous near the Chobe river, Upper Zambezi. I find that my more northern specimens differ only in the very much slighter development of the pale subapical patch to the primary. This pale area appears in the male to be due to the absence of scales rather than to the presence of white pigment. Wet-season males are rather more heavily marked than the dry ones, which frequently have the spots of the primaries much reduced. Occasional individuals of this latter type have the black apex nearly if not quite as narrow as a heavily tipped specimen of the type race. They can, however, be distinguished at a glance, in these cases, by the great reduction, sometimes disappearance, of the spots on the primary and a general reduction of all the markings of both wings. An extreme of this sort is figured by Thurau, *loc. cit.* pl. ii. fig. 9, as var. *utengulensis*. Dry females, except that they are duller coloured, do not differ much from the males. With regard to wet females of this race it is unfortunate that the specimen figured by Trimen is probably somewhat aberrant. I have taken the wet-season phases only in Katanga; I did not have an opportunity of doing so in the Lake Bangweolo district, etc. These wet Katanga females, four in number, resemble Mr. Trimen's figure in possessing a well-marked white subapical bar, but are larger and the red colour is entirely replaced by a dusky grey shade.

This western race of the species appears to extend from the Damara-land localities given by Mr. Trimen across the Upper Zambezi through the south-eastern portion of the Congo State to the districts of Lakes Bangweolo, Mweru, and Tanganyika. There is also one specimen of this race in the British Museum from the Victoria Nyanza, already referred to by Mr. Trimen. The fact that typical *acrita*, which occurs in the mid-Chambezi valley in N.E. Rhodesia, is replaced by *ambigua* on the north-eastern shore of Lake Bangweolo is highly remarkable, there being no geographical peculiarity to account for this. The representative of what is perhaps a third race of *acrita* is figured by Weymer, Iris, Dresden, 1903, p. 225, pl. ii. f. 4, under the name *acrita bella*. From the fact that the localities of *pudorina* Staud. and those of the eastern race of this species appear to overlap, without apparent gradations between them, it is possible that the former should be treated as a distinct species. I have, however, not been able to detect differences in the genitalia between this and the typical form. *A. chæribula* Oberth., which is treated by Professor Aurivillius as a form of *acrita*, is, as we shall see immediately, a quite distinct species.

Both races of *acrita* are on the wing throughout the year. They frequent woodland and wooded hill-sides. They fly rather low, but have an extremely steady and unusually *straight* flight for an *Acræa*. If once startled they fly considerable distances in a straight line, without deviating to right or left.

ACRÆA LUALABÆ, sp. n. (Plate I. fig. 4, ♂.)

Fulvous orange with apex of primary and spots black. Allied to *acrita* Hew.

♂. UPPERSIDE.—*Primary* fulvous orange, with a well-defined black apex and the following black spots:—one in cell; a discocellular; spots in areas 3 and 5 near internal margin of black apex; a large spot in 2 below extremity of cell; a spot in 1 *b* near outer margin, another in 1 *b* below cell near base.

Secondary. Ground-colour as primary; a black basal patch and the following black spots:—one in cell; a discocellular; a spot in 2 at junction of 1st submedian with median; two spots below costa and seven around end of cell, that in area 5 evanescent; a fenestrated black outer margin enclosing seven circular spots of ground-colour.

UNDERSIDE.—*Primary* as upperside but without black apex.

Secondary. Black basal area of upperside replaced by whitish enclosing three basal spots, also one in cell near its base and one each in 1 *a* and 1 *b* immediately below it; there is further a small spot between costa and precostal; also the following reddish streaks: one along base of costa, one passing longitudinally through cell-end, and three others connecting the two rows of spots lying in 1 *a*, 1 *b*, 1*c*.

Fringe of primary dusky, of secondary dusky becoming grey at anal angle and along inner margin; *palpi* pale ochreous tipped black; *thorax* black; *abdomen*: first three segments black, the 3rd bearing an ochreous lateral spot, the remainder dull fulvous; the last segment covered with long hairs dorsally blackish, ventrally ochreous.

Length of primary 22 mm.

Type ♂ in British Museum. Lualaba river, 18.iv.07.

Cotype ♂ in Hope Coll., University Museum, Oxford. Lualaba river, 22.iv.07.

This species at first sight might be taken for *acrita* Hew., which is evidently its nearest ally, but it differs in several particulars. Besides being a notably smaller insect, it is characterised by the presence of two subapical spots in primary which never occur in *acrita* and by a different arrangement of the submarginal spots in areas 3, 4, 5, 6 of secondary. *A. lualabæ* also differs in coloration and shape of the abdomen.

ACRÆA CHÆRIBULA.

Acræa chæribula Oberth. Ét. d'Ent. xvii. p. 19, pl. ii. fig. 16.
Acræa acrita var. *chæribula* Auriv. Rhop. Afr. p. 96.

I found this species plentiful throughout the high plateau country of Northern Rhodesia and Katanga, especially in the wet season, though it occurs throughout the year. It frequents woodland, particularly wooded hills, and is rather active on the wing, but easily captured as it flies very low and is by no means shy.

This insect has been confused by some authorities with *acrita* Hew., but is unquestionably distinct. I have no doubt on this point, having taken some 200 individuals at all seasons and having an even larger series of *acrita* with which to compare it. It may be distinguished externally by its uniformly smaller size, very deep black apex which is constant at all seasons, and black basal patch on uppermost part of base of secondaries. It differs also in colour, being, especially in the bright dry-season specimens, of a clear orange-red, never the rosy scarlet of *acrita*. The spots on primaries are further never enlarged in the wet-season as in *acrita*. Finally, the male genitalia differ considerably from those of *acrita*.

ACRÆA PERIPHANES Oberth.

This species is exceedingly abundant in plateau country everywhere west of the Mchinga escarpment. It does not apparently occur in the Luangwa valley. A very long series of this species of some 250 specimens exhibits very clearly what an astonishingly variable one it is. It appears to be in a highly unstable condition and to be in process of forming two or more well marked varieties. The chief of these are: (1) resembling the type figured by Oberthür Ét. d'Ent. xvii. p. 20, pl. ii. fig. 23; (2) a form in which the whole outer margin of the secondaries is suffused with black on both surfaces. On the underside the rectangular outer marginal spots of the type form are more or less overwhelmed and remain only as small triangular patches in the black ground.

The fringe in this form is also blackish, instead of whitish as in the type form. This character of a heavy black hind margin is usually, though not necessarily, associated with a rose-coloured suffusion of, at least, the secondaries. It is possible that this form exhibits a mimetic approach to the above mentioned *A. welwitschi* Rogerh., which is so conspicuous for its bright cerise colour and heavy black margins. I had for some time considered this form to be a seasonal one, but this appears to be not so. Though the latter is perhaps a trifle the commoner in the dry season, both forms occur in nearly equal numbers throughout the year.

A third form which may belong to both the above, so far as its hind margin is concerned, is characterised in the primary by the absence of the row of five spots beyond the end of the cell. This absence of spots coincides with a considerable increase of size in the basal spots of the primary, with the result that examples of this form have a marked resemblance to *acrita* Hew. A further complication which occurs in small numbers throughout all the forms, is the presence of a more or less heavy black apex to the primary. It must be also remembered that intermediates between all and each of the above forms occur. Further, I have been unable to find any differences in the genitalia of the extremes of the various forms, although the latter are so unlike as to have the appearance of distinct species.

ACRÆA ACUTIPENNIS.

Acræa acutipennis Lathy, Trans. Ent. Soc. 1906, p. 2, pl. i. fig. 3.

The collection contains four males of this recently described species, one captured on the Lualaba river, iv., and three others on the Lufupa and Lubudi rivers, x., xi. One specimen is very much more heavily marked than the type, especially on the secondaries, where many of the spots are "run." The abdomen also is black.

ACRÆA LACTEA, sp. n. (Plate I. fig. 7, ♀.)

A very pale species covered on upper surface with whitish scales.

♀. UPPERSIDE.—*Primary.* The whole wing, except for a moderate dusky apex, thinly covered with whitish scales; a faint discocellular dusky spot; two similar ones in 1 *b* and 2, the latter below end of cell, the former nearer the margin. A very narrow line of black along outer margin from black apex to posterior angle.

Secondary. More heavily scaled with whitish through which under-surface markings are visible; some of the spots of discal row slightly pigmented with dusky on upper surface. A narrow outer-marginal black line somewhat invading the wing along the veins.

UNDERSIDE.—*Primary* as upperside but apex greyish.

Secondary. Pale cream ground with following black spots:—a precostal; two in cell; two each in 1 *a*, 1 *b*, 1 *c* near base; a discocellular; two below costa and a discal row of seven of which those in areas 2 and 4 are placed nearer cell and those in 1 *c* and 3 are large and of irregular shape; those in 1 *a*, 1 *b*, 1*c*, and 4 are connected with spots nearer the base by rose-coloured internervular streaks. The fenestrated black outer margin encloses seven pale ochreous spots with a trace of an eighth at anal angle. The inner edge of this margin is marked by a series of brick-red internervular streaks which increase in size toward anal angle.

Fringe of both wings dusky.

Palpi very pale ochreous nearly white; *thorax* black with two white spots on vertex; *abdomen* above black, the 3rd to 6th segments each having a small white lateral spot; last segment fulvous below with a lateral fulvous line.

Length of fore wing 28·5 mm.

Type ♀ in the British Museum. Captured near the Belgian Post of Lulua, upper Lufupa river, 13.ix.07.

Cotype ♀ in Hope Coll., University Museum, Oxford. Captured on lower Lufupa river, 1.xi.07.

It is with some hesitation that I describe and name this curious species from females only, but I am quite unable to find any male in my own or any other collection to which it could belong. It would appear to have no close relationships, but the discovery of the male would probably be of assistance on this point. From the fact that the discal spots of the primary make a line at right angles to the costa, it must according to Professor Aurivillius' list be placed in the *acrita* group.

ACRÆA NOHARA CHAMBEZI, subsp. n. (Plate I. fig. 5, ♂.)

I captured in the Chambezi valley and near Lake Young at the end of October and beginning of November 1908 a small series of what appears to be a new northern race of *A. nohara* Boisd., which in some particulars is an extreme form of the *halali* Marsh. race of that species.

It is much larger than *halali* Marsh., of a bright rose-colour, and differing from it in the still further reduction of many of the markings, especially of the dark outlines to the veins on the apex and outer margin of the primaries. In the secondaries on the contrary the black margin is rather heavier on the average than in *halali*.

In the secondaries also, the three spots in the discal row in areas 1 *b*, 1 *c* and 2 *form a straight line*, thus distinguishing *chambezi* from *halali* at a glance.

In the presence of a discal spot in area 1 *b* of primary and in area 3 of secondary, *chambezi* agrees with *nohara* and differs from *halali*.

Except for two obviously dwarf individuals the average length of the primary is 27 mm., compared with about 25 mm. in *nohara* and 23 in *halali*.

The female differs only in the colour of the upperside of the *primaries*, which is tinged with ochreous and lacks the bright rose-red colour of the male.

Described from twelve males and two females.

Type ♂ in the British Museum. Chambezi valley, 28.x.08.

Type ♀ and cotypes in the Hope Coll., University Museum, Oxford.

ACRÆA ATOLMIS.

Acræa atolmis Westw. Oates' Matabeleland, p. 343, pl. F. figs. 3, 4.

I took this brilliantly coloured species commonly in the Broken

Hill district, N.W. Rhodesia, ix. and x. 1905, and in Katanga I found it plentiful in the Lualaba valley, x. and xi 1907. Some of the wet-season females from the last-named locality are nearly black. It is a somewhat local species, frequenting nevertheless rather varied country, as I have taken it both in woodland and open grassy plains. I also captured a few individuals in the lower Chambezi valley, N.E. Rhodesia, x. 1908.

ACRÆA LEUCOPYGA.

Acræa leucopyga Auriv. Ent. Tidskr. 1904, p. 92, fig. 32.

I took this species in the Luangwa valley, on both my expeditions, from January to March. The specimens are consequently all wet-season ones, and differ a little from Prof. Aurivillius' figure of the type which appears to be a dry-season specimen. My specimens are smaller and have heavy black margins of varying width to the secondaries. The females also, as in so many other wet-season Acræinæ in this part of Africa, are very dull-coloured and have a varying amount of dusky suffusion over the base of both wings. The females further have the whole of the abdomen black with white lateral spots and lack the white apical segments described by Aurivillius. This character is, however, well marked in the males.

I took this species sparingly, ten males and eight females, in the Luangwa valley only. It has the same low flight as *oncæa* Hopff. and somewhat resembles it on the wing.

ACRÆA INTERMEDIA.

A. intermedia Wichgraf, B. E. Z. liii. 1908, p. 241, pl. 6. figs. 3, 4.

I took three males of this recently described species on the Lualaba river, iv. and v, 1907, and subsequently a very dry female on the Kalungwisi river, ix. 1908. This specimen has all the markings much reduced, and a mere trace of the subapical white is figured in Wichgraf's specimen.

ACRÆA MIMA, sp. n. (Plate I, figs, 8, 9, ♂, ♀.)

Allied to *A. rhodesiana* Wichgraf, B. E. Z. liii. 1908, p. 240, pl. 6. figs. 1, 2, but with a black, white-barred apex to primary. The discal spots of 1 *b* and 2 of primary, in both species, make a line perpendicular to the hind margin, bringing them into group III, subgroup 7 of Professor Aurivillius' Catalogue, near *A. caldarena* Hew.

UPPERSIDE.—*Primary.* Apical portion of wing suffused with black, deep black at tip, becoming a dark greyish toward discal area. This dark suffusion covers rather more than the distal half of the cell on the costal margin and on the outer margin becomes reduced to a narrow dark line as it approaches posterior angle. Remainder of wing of a bright salmon-orange, scattered at base with some dusky scales and bears following black spots: a large spot within cell; a discocellular; beyond extremity of cell a row of five black confluent spots extending to 2nd submedian, the last distinct from the row: immediately beyond this row and between it and deep black apex, is a well-defined white bar, of about the same length as the row of black spots and 4 mm. wide; a small spot in 1 *b*, a little proximal to junction of median with 1st submedian; two larger spots in areas 2 and 1 *b*, making a line perpendicular to hind margin, and placed a little distal to end of cell.

Secondary. Salmon-orange ground-colour as primary: base suffused with dusky, especially toward inner margin, somewhat obscuring spots in this area; ground-colour with black spots of which best defined are: one immediately above middle of cell; two within cell; a discocellular; a discal row of seven around cell end, of which 4th and 6th are placed more proximally than others: a well-defined, rather narrow outer margin narrowing to a fine line at anal angle.

UNDERSIDE.—*Primary* as upperside but black apex replaced by ochreous except along apical portion of costa which is pale yellow; ground-colour pinkish ochreous; two additional small spots near base of costa of which the more proximal is the larger.

Secondary. Base flushed pink; ground-colour bright ochre; spots as upperside with following additions:—one between costal and precostal; three basal spots; one above, one below and two within cell all outlined with pale yellowish; discal row around cell-end has two additional ones towards inner margin; black outer margin encloses seven pale greenish semilunar spots.

Fringe grey, more pronounced on secondaries; *palpi* ochreous; *vertex* and *thorax* above bright rufous; *abdomen*: first three segments black, 2nd and 3rd with an ochreous lateral spot, remaining segments fulvous somewhat paler below.

Length of primary 30 mm.

The female differs from the male only in still greater suffusion of black over primaries and greater width and definition of white bar, which is 5 mm. wide. The abdomen is also entirely black with creamy white lateral spots and ochreous ventral lines. One female is a melanic aberration being much suffused with black, the spots "run" and the subapical white bars are much reduced.

Type ♂ in British Museum. Serenji district, N.E. Rhodesia, 18.xii.07.

Type ♀ in British Museum. S.E. border of Katanga, Congo State, 13.xii.07.

Cotypes in Hope Coll., University Museum, Oxford, from the same localities.

This handsome species is evidently nearly allied to *A. rhodesiana* Wichgr., but differs from it in the presence of a broad black apex and strongly marked white subapical bar, especially in the male. In a male of *rhodesiana* in the British Museum, the colour of the abdomen also differs, being ochre-brown throughout with five lateral spots instead of two. *A. mima* may possibly prove to be a mimetic race of *rhodesiana*, but until there is more evidence on the point, I think it should stand as a distinct species.

I captured four males and three females of this species, two in the extreme south-east corner of the Katanga region of the Congo State, and the remainder over the British border in the Serenji district of N.E. Rhodesia, xii. 1907. It was flying about woodland and old native gardens and had a fairly strong and steady flight. Owing to its rosy colour when fresh it bears on the wing a strong resemblance to *Mimacræa marshalli* Trim., more so than to *A. encedon* or *Limnas chrysippus*.

ACRÆA DETECTA, sp. n. (Plate I. figs. 6, 6 *a*, ♂.)

This species is allied to *A. caldarena* Hew., which it closely resembles in general appearance. The ground-colour is much more fulvous and is without the pinkish tinge of that species except in some of the very dry specimens. The primaries have a more rounded apex and are markedly less heavily scaled than in *caldarena*. Though of the same general character there are some important distinctions in the genitalia of these two species. The ventral harpes of *detecta* are broader and much more rounded than those of *caldarena*. The penis is also very characteristic, in *detecta* being very slender, curved and with a distinct barb at the tip. In *caldarena* it is a stout, straight organ and lacks a barb (Pl. I. fig. 6 *b*). Owing to the fact that both of these species often die with the penis extruded, it is frequently possible to detect this latter character without dissection.

♂. UPPERSIDE.—*Primary*. Much as *caldarena* but the black apex usually somewhat narrower and inwardly less well defined. Spotting variable and often much reduced. A well marked spot within cell and a discocellular always present. One, two, or three subapical spots (occasionally four in females) form a row near inner edge of the black apex. A small spot in area 1 *b*, below cell near its middle (often absent). Of the two spots in areas 1 *b* and 2 (the latter sometimes absent) which lie below end of cell, the former is placed a little *distally* to the latter (*not immediately below it or a trifle proximally to it as in* caldarena). As regards this character, *detecta* is intermediate in markings between the two groups of which *caldarena* and *acrita* may be taken as typical. There also is occasionally a small submarginal spot in 1 *b*

Secondary much as in *caldarena* but more rounded, the basal black better defined. The arrangement of the spots also differs but is best described from the underside.

UNDERSIDE.—*Primary* as upperside but without the black apex.

Secondary. Spots on the whole as in *caldarena* but larger and more rounded, this is especially noticeable in the more distal of the two spots within the cell, which is never elongated as in *caldarena*. Of the spots in the discal row, that in area 5 is much more *distally*, that in area 2 more *proximally* placed, giving a very different appearance to this row. The basal pink flush is less extensive than in *caldarena*, and the cream-coloured spots enclosed in the fenestrated black line forming the hind margin are somewhat wider and deeper.

The females of this species are less easily distinguished from those of *caldarena* but exhibit the same characteristics in the distribution of spots. They are very variable in colour and exhibit the same tendency to duskiness in the wet season as do those of *caldarena*, and also often have a whitish, lightly scaled subapical area. Specimens of *detecta* differ a good deal in size but are on the average considerably smaller than the *caldarena*. The species is described from 15 males and 11 females, all from the Luangwa valley.

Type in the British Museum; cotypes in the Hope Coll., Oxford.

I found this species in fair numbers in the Luangwa valley especially in the wet season. It occurs side by side with *caldarena*, and indeed for a long time I did not distinguish the two species.

ACRÆA CALDARENA.

Acræa caldarena, Hew. Ent. M. Mag. xiv. p. 52 (1877).

This species was abundant in the Fort Jameson district and the whole Luangwa valley. It occurred sparingly on the Alala plateau between the Luangwa river and Broken Hill, but I did not take it to the north of the Chambezi river, in N.E. Rhodesia, nor anywhere in Katanga. Within its range it is equally common either in woodland or in the open. It has a weak flight and keeps near the ground. It is on the wing at all seasons but is scarcer in the dry season when it is usually of a brighter colour, some specimens from the hot dry Luangwa valley being a peculiar shade of salmon-pink.

ACRÆA ATERGATIS Westw.

Sparingly in the Broken Hill district and in the northern portion of N.E. Rhodesia. Common in Katanga. Does not occur in the Luangwa valley or apparently east of it. It is on the wing all the year except in the height of the dry season, vii. and viii. Much resembles *A. atolmis* Westw. on the wing, and frequents rather open country.

ACRÆA AXINA Westw.

Fairly common between Tete on the Zambezi and Fort Jameson, ii. and iii. One female was taken on the Alala plateau, xi. These localities seem to be about the northern boundary of the species.

ACRÆA ONCÆA Hopff.

Abundant at all seasons in the Luangwa valley and to the east of it. Somewhat local west of the Mchinga escarpment, but fairly common in the Lake Bangweolo district. Not met with in Katanga. This species furnishes another instance where the females exhibit a marked tendency to melanism in the wet season. Many females also have a more or less well marked subapical white bar.

ACRÆA NATALICA Boisd.

A common species everywhere and at all seasons, more especially in the Luangwa valley where it is quite the most dominant of all the larger Acræinæ. Dry-season specimens, especially from the mid-Zambezi and lower Luangwa, are often much smaller and more brightly coloured. Both this species and *A. anemosa* Hew. are closely mimicked by some remarkable moths of the genus *Hibrildes*. Of these there was one, *H. crawshayi* Butl., which I took pretty commonly in the Luangwa valley during the rains. This insect has not only the markings of an *Acræa*, especially on the underside, but hangs on grasses etc. in identically the same attitude.

ACRÆA RAHIRA Boisd.

I took two specimens of this species on the Alala plateau, ix. 1905, and subsequently found it common in swamps in the valley of the Chambezi, iv. and v. It seems to be confined to swamps and marshy ground, which accounts for its being very local. Its flight is very feeble. The majority of my specimens are markedly paler in colour than those from S. Africa.

ACRÆA SERENA Fabr.

Ubiquitous and on the wing all the year. Especially abundant in hot low-lying regions and particularly frequents the clearings of old native gardens, etc.

ACRÆA VENTURA Hew.

A fairly common species in the open country of the high plateau from Broken Hill to Tanganyika. Not taken in the Luangwa valley or in Katanga. It is on the wing all the year.

ACRÆA VINIDIA Hew.

This little species is common everywhere and at all seasons, especially in hot low-lying localities.

ACRÆA SOTIKENSIS E. M. Sharpe.

This species does not occur in the Luangwa valley or the Broken Hill district, but is common west of the Mchinga escarpment and in Katanga. It is a woodland and forest species with rather a swift flight for its size. Some specimens, especially those from Katanga, have the subapical bar orange-red like the ground-colour, instead of yellow as in the type.

ACRÆA BONASIA Fabr.

Not uncommon in the valleys of the Kalungwisi and Lofu rivers in N.E. Rhodesia and in the Lualaba valley in Katanga. It seems to be confined to dense forest. These specimens belong to the type form rather than to *alicia* E. M. Sharpe, the eastern race of the species.

ACRÆA CABIRA APECIDA.

Acræa apecida Oberth. Ét. d'Ent. xvii. p. 24, pl. ii. fig. 15.

Not rare in the Luangwa valley during the rainy season but not taken elsewhere except near Kambove, Katanga, ii. & iii., where it was scarce. A forest species.

ACRÆA PHARSALUS Ward.

Not uncommon throughout Katanga from November to April. Not taken in Northern Rhodesia.

ACRÆA ENCEDON L.

I took this everywhere. The type form is perhaps the commonest, though not much more so than *daira* Godm. & Salv. The *lycia* Fabr. form occurs rarely in Katanga and more commonly in the valleys of the Kalungwisi and Lofu rivers in N.E. Rhodesia. Some very large brilliantly coloured specimens of the type form were taken on the Lualaba. On the islands on Lake Bangweolo all the specimens taken, both of the type form and of *daira*, are large, brightly coloured and heavily marked, the spots in areas 1 *b* and 2 of primary being much "run" and enlarged.

ACRÆA sp. near PENELEOS Ward.

A single specimen of the species which has been recorded from several parts of Central Africa under this name, but is probably not identical with that species. This specimen, a male, was captured on the Lubudi river, West Lualaba district, 19.x.07.

ACRÆA ESEBRIA Hew.

Represented by a single male, captured in dense forest, 23.x.07, between the Lufupa and Lubudi rivers.

PLANEMA POGGEI Dewitz.

I took several specimens of this handsome *Planema*, ix. 1908, in some dense forest on the Kalungwisi river, N.E. Rhodesia.

PLANEMA MONTANA Butler, P. Z. S. 1888, p. 91.

P. aganice var. *montana* Auriv. Rhop. Æth. p. 121.

I took a single pair of this species in a patch of dense forest, a little north of the Lofu river on the Tanganyika plateau, viii. 1908. It has a sluggish floating flight.

PLANEMA MACROSTICHA.

Planema macrosticha Beth.-Baker, Ann. N. H (8) ii. p. 472 (1908).

I have a single female *Planema* in the collection which I attribute, with some doubt, to this species. There is a general resemblance in the distribution of markings to those of the male type, the bands across both wings being however whitish. It was captured on the Lualaba river, v.

Subfam. NYMPHALINÆ.

LACHNOPTERA IOLE Fabr.

This species occurred sparingly in patches of dense forest in the western portion of the basin of the Lualaba, but I did not observe it elsewhere. It is not unlike *A. phalantha* Drury on the wing, but is distinguishable by its larger size and clearer coloration.

ATELLA PHALANTHA Drury.

I found this insect ubiquitous and at all seasons. It seems to frequent all sorts of country except the most dense forest, to the outskirts of which it is, however, especially partial. It has a swift and active flight and is not too easy to capture on the wing, but is much addicted to quenching its thirst on damp mud. As my friend Mr. Guy Marshall * has already recorded, I once saw a little Bee-eater, *Melittophagus meridionalis*, capture and eat what I believe to have been one of these insects or possibly its mimic, *Pseudargynnis hegemone*.

ATELLA COLUMBINA Cram.

Upper Lualaba river, 10.v.07. Lofu river, Lake Tanganyika, 17.vii.08.

Not taken elsewhere. It may, however, on occasions have been mistaken for the preceding species.

BRENTHIS EXCELSIOR KATANGÆ, subsp. n. (Plate II. fig. 3, ♂.)

Closely allied to *B. excelsior* Butler, but differs from all specimens of that species I have seen in the following particulars:—

Upperside. Ground-colour a less deep orange, all black markings, especially the marginal ones, very much less heavy.

Underside. Black markings also smaller. The very pale ochreous area of tip of primary and greater part of secondary in the type is much darker in colour and is largely concealed by a reddish-chocolate wash. In *excelsior* this chocolate wash is confined to the hind wing, and comprises a small patch within the cell and two in the discal area of which the largest is that lying near the anal angle. In *excelsior katangæ* the reddish-chocolate wash occurs as a marginal patch in the apex of the primary, and practically covers the whole of the secondary, with the exception of a streak running from the middle of the costal margin past the end of the cell down area 5 to the outer margin, and a patch in middle of the hind margin.

Length of wing 19 mm., as compared with 20 in typical *excelsior*.

Type ♂ in the British Museum; captured at the Belgian Post of Msofi, a few miles over the border, and some 16 miles north from Kansanshi, in N.W. Rhodesia, 30.i.07. The only specimen I ever met with.

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* Trans. Ent. Soc. 1909, p. 359.

Pyrameis cardui L.

This well known insect occurs everywhere in Central Africa. It seems to be most numerous in the dry season and, preferring somewhat open country, is particularly addicted to the clearings formed by native gardens. In these places it may often be seen basking in the hottest sun amongst the dried and felled mealie and millet stalks after the harvest has been gathered.

Vanessula milca Hew.

I found this small insect by no means uncommon in Katanga, and it seems to be on the wing at all seasons, especially during the rains. I never saw it in N.E. Rhodesia. It usually frequents flowers, low-growing shrubs, etc., on the outskirts of dense forest, and although active and restless has not a very powerful flight.

Precis orithya madagascariensis Guer.

This insect occurs everywhere, but, so far as my experience goes, is nowhere very abundant. It obtrudes itself a good deal upon the collector's notice, as it is particularly fond of cleared ground near buildings, etc.

Precis œnone clelia Cram.

The same remarks apply to this species as to the last; it is, however, perhaps somewhat less abundant. It occurs, as does the last, throughout the year, and from the numbers of much worn specimens to be seen during the dry season, I believe it to survive that period in the imago state.

Precis hierta cebrene Trim.

Like the last, this species occurs everywhere and has similar habits but is much more abundant. It exhibits better marked seasonal forms than its allies.

Precis sophia Fabr.

Occurs throughout the high plateau country in N.E. Rhodesia west of the Mchinga escarpment, but is less common in Katanga. It is an open country species and is on the wing throughout the dry season.

Precis octavia sesamus Trim.

This insect is nowhere rare, the dry-season *sesamus* form, although a more retiring insect, being apparently more common than individuals of the wet *natalensis* phase.

Precis antilope Feisth.

Precis simia Wallgr.

A common species in woodland areas throughout the country, including Katanga.

PRECIS CUAMA Hew.

Precis trimeni Butler.

Common in woodland in the Zambezi and Luangwa valleys side by side with the preceding. This species appears not to be present in Katanga or the high plateau country of N.E. Rhodesia west of the Mchinga escarpment, additional evidence that it is probably a distinct species from *antilope*.

PRECIS CERYNE Boisd.

Precis tukuoa Wallengr.

A common species over all the high plateau wherever there is sufficiently open country. It is more addicted to open grassy plains than any other species of *Precis* with which I am acquainted except *sophia* Fabr.

PRECIS PELARGA Fabr.

This is a common woodland species at all seasons. Specimens from the Luangwa valley belong to f. *actia*, whilst all those from the high plateau country of N.E. Rhodesia and throughout Katanga are intermediate between that form and typical *pelarga*, the males of the dry specimens, at least, being dimorphic.

PRECIS TUGELA Trim.

Not rare in well-wooded localities throughout the country. Particularly common in the thickets on the islands of Lake Bangweolo.

PRECIS ARCHESIA Cram.

Precis pelasgis Godt.

This species occurs everywhere but is nowhere very common, the wet-season form *pelasgis* being distinctly scarce in my experience. Dry-season specimens from Katanga approximate to the form *staudingeri* Dewitz. It is a woodland species, more common in hilly country than anywhere else.

PRECIS TEREA ELGIVA Hew.

A common insect in well-wooded localities throughout the high plateau country, including Katanga. Not met with in the Luangwa valley.

PRECIS NATALICA Feld.

Ubiquitous at all seasons.

PRECIS ARTAXIA Hew.

Precis nachtigalli Dewitz.

Ubiquitous in woodland. The wet-season form, *nachtigalli* Dewitz, is scarce and usually on the wing only from mid-December to mid-January, but I have taken an occasional very worn specimen as late as the beginning of March.

PRECIS TOUHILIMASA Vuillot, An. Soc. Ent. Fr. 61. Bull. p. cxlviii (1892).

Precis pavonina Butler, P. Z. S. 1895; p. 257, pl. xvi. figs. 1–3.
Precis nobilitata Thurau, B. E. Z. xlviii. p. 137, pl. ii. fig. 11.

This handsome species is not uncommon but decidedly local. It occurs only in the Congo basin, and does not appear to cross the Congo-Zambezi watershed. It frequents a particular type of woodland where there is large timber and numerous thickets, the sort of spot where the rubber-vine is plentiful. The wet-season form, *pavonina* Butler, is on the wing longer than that of the preceding species, occurring up to the end of March.

CATACROPTERA CLOANTHE Cram.

A ubiquitous species, on the wing at all seasons.

SALAMIS ANACARDII NEBULOSA Trim.

A single specimen captured in the mid-Luangwa valley, viii.

SALAMIS PARHASSUS ÆTHIOPS Pal.

Occurs throughout the country in the neighbourhood of forest, and is on the wing at all seasons.

SALAMIS TEMORA Feld.

Lualaba valley, 1 ♂, 16.iv.07.
The only specimen met with.

HYPOLIMNAS MISIPPUS L.

Occurs everywhere during the wet season but is nowhere abundant, especially in Katanga, though fair numbers of males are sometimes seen. The typical and *inaria* forms of the female seem to occur in about equal proportions.

HYPOLIMNAS ANTHEDON Dbl.

I found this a very rare insect, and captured only a single worn specimen in the Luangwa valley, xi. Subsequently I met with one or two specimens on the Lualaba river, v., and on the Kalungwisi river, xi.

EURYTELA DRYOPE Cram.

A common and ubiquitous insect, confined however to shady spots on stream banks, patches of forest, etc.

EURYTELA HIARBAS Drury.

A single specimen from the Lubudi river, x.

ERGOLIS ENOTRÆA Cram.

Represented in the collection by a single specimen collected on the Lubudi river, x.

HYPANIS ACHELOIA Wallengr.

A ubiquitous insect, preferring open spots. It is on the wing all the year.

CRENIS OCCIDENTALIUM Mab.

Only represented by four specimens captured on the upper Lufupa river, x., and one in the same month on the lower Chambezi.

CRENIS MORANTII Trim.

Represented by a single male from dense forest, Kalungwisi river, ix. 1908.

CRENIS TRIMENI Auriv.

This species was swarming on the Lufupa and Lubudi rivers, x., but I did not meet with it elsewhere.

CRENIS CONSORS.

Crenis consors Rothsch. & Jord. Nov. Zool. 1903, p. 532.

Occurs throughout the basin of the Lualaba river and was specially abundant, x. A difficult species to catch as it is shy and usually settles on tree-trunks some 12–15 ft. above ground.

CRENIS ANSORGEI.

Crenis ansorgei Rothsch. & Jord. Nov. Zool. 1903, p. 534.

This species is represented by three specimens from the neighbourhood of Broken Hill, ix.–xi. 1905, and one from the Lufupa river, x., and by a small series from the lower Chambezi valley, x.

CRENIS BOISDUVALI Wallengr.

Occurs sparingly throughout the country during the wet season but seems nowhere common.

CRENIS AMULIA Cram.

I found this species common in the basin of the Lualaba river especially in October.

CRENIS ROSA Hew.

This species occurs to the east of the Broken Hill district on the Alala plateau and through the Serenji district up to the Chambezi valley, and everywhere to the east of these parts. To the west it is replaced by the next species, *C. pechueli* Dewitz. These large blue *Crenis* frequent woodland country, especially wooded hill-sides. They are not nearly so conspicuous on the wing as might be supposed from their appearance in the cabinet. An inexperienced observer, except for their more powerful flight, might easily mistake them for *H. dædalus* on the wing. They habitually settle on tree-trunks at some ten feet or more from the ground, and at this distance their striking underside blends harmoniously with their surroundings.

CRENIS PECHUELI.

Crenis pechueli Dewitz, N. Acta Ac. N. Cur. 41. 2. p. 195, pl. 26. fig. 1 (1879).

Crenis rosa Auriv. (parte) Rhop. Æth. pp. 161, 162.

This species replaces *rosa* to the west of the localities mentioned under that species, occurring on the upper Kafue, throughout Katanga (where it swarmed in October), and in the Lake Bangweolo district up to the south of Lake Tanganyika. It does not differ from *rosa* in its habits. Occasionally, as in the Lake Bangweolo district, both species occur together.

NEPTIS MARPESSA Hopff.

This species is very common in the Luangwa valley at all seasons, less so west of the Mchinga escarpment. It is on the wing throughout the year and frequents well wooded and shady spots.

NEPTIS NEMETES Hew.

Represented by a single specimen from the Lualaba river, 4.v.07.

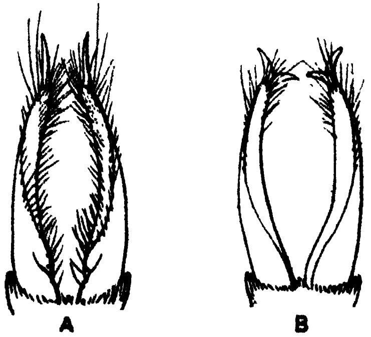
NEPTIS AGATHA Cram.

This species is ubiquitous and on the wing at all seasons.

NEPTIS JORDANI, sp. n. (Plate II. fig. 1.)

Bears a very close general resemblance to *N. agatha* Stoll, but is a smaller insect with certain small but constant differences in the markings. The chief of these are: in the *primaries* the subapical white band is narrow and *not* widened out toward the apex in areas 6, 5, 4, thus having a distal outline different to that of the same band in *agatha*. The band on the *secondaries* is

Text-fig. 1.



Ventral view of claspers of A, *Neptis agatha*; B, *N. jordani*.

characterised by being markedly more denticulate and projecting toward outer margin in areas 5 and 4.

UNDERSIDE.—A dark patch invariably obscures the submarginal white markings of the outer margin of the *primaries* in the lower half of area 4 and the whole of area 3. A tendency to this latter character also appears in some individuals in the Hope Collection from the West Coast, which appear to be indistinguishable from typical *agatha*. Whether they are really so seems to be a point which will not be cleared up until some attempt is made to unravel the confusion in which this genus now is.

The other markings of *jordani* much resemble those of *agatha*. The margins, especially of the *secondaries*, are however somewhat more markedly denticulate than those of *agatha*.

Type ♂ in the British Museum: Chishi Island, Lake Bangweolo, 25.vi.08. Type ♀ in the British Museum: Kambove, Katanga, 17.ii.07.

Cotypes in the Hope Coll., Oxford.

Described from over 50 specimens.

I am greatly indebted to Dr. Karl Jordan of the Zoological Museum, Tring, for his assistance with this puzzling species, and I have the honour of dedicating it to him. He has been so kind as to examine the genitalia of the species and of typical *agatha* from the same place, and he pronounces them to be quite distinct.

I had long been convinced from my field experience that *jordani* represented a distinct species. Whilst I found *agatha* ubiquitous in Northern Rhodesia, etc., *jordani* was distinctly local. It usually frequents rather hot dry localities, such as river-valleys where there are thickets or dense bush. I originally captured a pair *in copulá* on the Alala plateau, north-east of Broken Hill, xi. In Katanga I took it sparingly, chiefly in river-valleys, ii.-x., and subsequently found it abundant in the thickets on the shores and islands of Lake Bangweolo. It has a more restless, active, and less floating flight than *agatha*.

NEPTIS MELICERTA Drury.

Three specimens from the Lualaba river, iv. and v., and one from the upper Lufupa, x. A lover of dense shade.

NEPTIS GOOCHI Trim.

Sparingly in Katanga and on the Lofu river, Lake Tanganyika. A forest species.

NEPTIS CONSPICUA.

Neptis conspicua Neave, Nov. Zool. xi. p. 329, pl. i. fig. 15 (1904).

Four specimens from the Lualaba river, iv. and v., 1907. A forest species.

PSEUDACRÆA LUCRETIA TARQUINIA Trim.

A rare insect in the interior, though seen on the lower Zambezi.

Represented in the collection by a single specimen from the mid-Luangwa valley, viii.

PSEUDACRÆA POGGEI Dewitz.

A by no means rare species throughout Katanga and the northern portion of the plateau country of N.E. Rhodesia. It is on the wing throughout the year, but is uncommon during the dry season, and then seems to confine itself strictly to dense forest. In the wet season, when much more abundant, it haunts the woodland country and clearings in the forest. On these occasions it may sometimes be seen side by side with its model, *Limnas chrysippus*, and the resemblance both of flight and colouring is so exact that it is quite impossible to distinguish them on the wing.

PSEUDACRÆA TRIMENI Butler.

This species occurs rarely in Katanga, and I did not meet with it elsewhere.

PSEUDACRÆA DOLOMENA Hew., ? f. RUBROBASALIS Auriv.

A single specimen of what is very near to this form of the very variable *dolomena* was captured in a patch of dense forest between the Lubudi and Lufupa rivers, Western Katanga, x.

PSEUDACRÆA SEMIRE Cram.

I captured two specimens of this species in dense forest on the lower Kalungwisi river, ix.

PSEUDONEPTIS CŒNOBITA Fabr.

A forest species, not rare in suitable localities in the Lualaba valley, but not met with elsewhere. It has a general resemblance to a *Neptis* when on the wing, but has a more active and less floating flight.

PSEUDARGYNNIS HEGEMONE Godt.

This insect is common and widely distributed throughout the more open plateau country, both of N.E. Rhodesia and Katanga. It often may be taken at damp mud, and I once captured an individual of this species amongst some 14 specimens of its model, *Atella phalanta*, on such a spot. It is on the wing throughout the year.

Form *nyassæ* Bartel * appears to be described from an extreme dry-season specimen, and does not, I think, represent a local race.

CATUNA CRITHEA Drury.

This species is common in patches of forest in Katanga and in the Kalungwisi and Lofu valleys in N.E. Rhodesia. I have never taken it out of dense forest. It has a somewhat weak flight and is always near the ground. It is, however, a wary species and not easy to capture in the densely forested places it frequents. It occurs at all seasons.

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* Nov. Zool. xii. p. 138.

ATERICA GALENE Brown.

A common species in low-lying forest country within the Congo basin. Like many other allied Nymphalinæ it habitually settles on or very near the ground, but is wary and not easy to capture.

HAMANUMIDA DÆDALUS Fabr.

This is the most abundant and ubiquitous species in the country. It may be met with everywhere, from the densest shade to the most bare spots exposed to the hottest sun.

EUPHÆDRA RUSPINA Hew.

Represented by a single male captured on the Lualaba river. 14.v.07. This and all the following species of *Euphædra* have similar habits. They frequent dense forest or clearings in its immediate vicinity. They usually settle on or near the ground, but are wary and when startled their flight is very swift.

EUPHÆDRA ELEUS Drury.

Not rare on the Lubudi and Lufupa rivers, x., in dense forest. Two individuals captured on the Kalungwisi river, viii.

EUPHÆDRA ELEUS, var. COPRATES Druce.

A single specimen captured on the Dikulwe river, Kambove district, 2.iv.07.

EUPHÆDRA COOKSONI.

Euphædra cooksoni Druce, Ann. Nat. Hist. (7) xvi. p. 550.

Six males and two females of this recently described species were taken on the Lualaba river, iv. and v., and one male on the Lubudi river, x.

EUPHÆDRA HERBERTI E. Sharpe.

Not uncommon on the Lualaba river, iv. and v.

EUPHÆDRA ZADDACHI CRAWSHAYI Butler.

I found this striking species scarce on the Lualaba river in Katanga, but not rare in N.E. Rhodesia, in the Chambezi and Kalungwisi valleys, and the neighbourhood of Lake Bangweolo. It is an interesting species inasmuch as it is not nearly so confined to dense forest as its allies; although often found in such places it may also frequently be seen in more open woodland flitting round shrubs, etc. Under these circumstances it certainly much resembles the moths of the genus *Xanthospilopteryx* which it is believed to mimic. Except on the Lualaba river, iv., and on the lower Chambezi, x., I did not see this species on the wing with the moths, of which the two commonest species were *africana* and *perdix*. This was doubtless due to the fact that I reached the range of the *Euphædra* on the high plateau only at the beginning of the dry season. While the *Euphædra*, like many of its genus, survives the dry season as an imago, the moths, so far as my experience goes, are strictly confined to the rains.

This *Euphædra* is an extremely wary species with a powerful flight and by no means easy to capture. Butler's species *crawshayi* appears to represent the eastern race of *zaddachi* Dewitz, but the differences are very slight.

EUPHÆDRA MEDON L.

Not rare in the Lualaba district of Katanga and in the valley of the Kalungwisi in N.E. Rhodesia. Like many other species of *Euphædra* it is on the wing throughout the dry season, though specimens taken during that period are all more or less worn.

EUPHÆDRA LOSINGA Hew.

Sparingly on the Lualaba river probably throughout the year.

EUPHÆDRA NEOPHRON Hopff.

Not rare in the lower Luangwa and mid-Zambezi valleys, where it seems to be the sole representative of its genus. It usually frequents the thickets and forest near streams, etc. Does not occur on the plateau west of the Mchinga escarpment or in Katanga.

EURYPHENE PLISTONAX Hew.

Represented by a single female captured near the lower Lufupa river, 5.x.07. This specimen was taken in deep shade in a dried-up stream-bed.

EURYPHENE MARDANIA Fabr.

Not rare in forest in the Lualaba district, but wary and difficult to capture.

EURYPHENE SENEGALENSIS ORIENTIS Karsch.

Scarce in thickets or forest in the lower Luangwa valley.

EURYPHENE SOPHUS Fabr.

A single male captured in forest on the Lualaba river, 5.v.07.

DIESTOGYNA VERONICA Cram.

A series of three males and four females from the Lualaba river, iv., v., and x. The males are indistinguishable from West Coast specimens except for the reduction of the small subapical white spots. The females, however, are of great interest, being more like those of *D. tadema* Hew. and allies in general coloration. They entirely lack the rufous suffusion of West Coast females of *veronica*, the subapical band of primaries being buff, not white, and the discal area of the secondaries being also buff.

This species occurred sparingly in dense woodland. It flies near the ground, but is wary and not easily captured.

DIESTOGYNA IRIS.

Diestogyna iris Auriv. Arkiv Zool. p. 250 (1903).

This recently described species is very common throughout Katanga and the northern portion of N.E. Rhodesia, west of the Mchinga escarpment. It frequents woodland of a rather dense type varied with patches of thickets. It does not occur in forest like most of its allies. It would seem to be a true Batesian mimic of *Limnas chrysippus*. It usually settles on the ground, and when doing so, temporarily sits with expanded wings showing its *chrysippus*-like coloration. When going to rest, however, it settles with closed wings among dry leaves, and then, owing to its cryptic underside, is extremely inconspicuous.

CRENIDOMIMAS CONCORDIA Hopff.

Not rare throughout the high plateau country of N.E. Rhodesia and Katanga. It much resembles species of blue *Crenis* on the wing, but is more active and has a swifter flight. It is not uncommonly taken at damp mud.

HARMA THEOBENE Dbl. & Hew.

Not rare in the Lualaba district, iv. and v., and in the lower Kalungwisi valley, ix. A forest species.

HARMA EGESTA Cram.

I took this species sparingly on the Lubudi and Lufupa rivers during October.

EUPTERA ELABONTAS MWERUENSIS, subsp. n. (Plate II. fig. 2, ♂.)

Differs from typical *elabontas* Hew.* in the greatly increased size and completeness of the bands on both wings, which, in common with all the markings, are of a pale sulphur-yellow colour. The discal band of primaries from vein 4 to hind margin is especially broad and not broken up into spots as in the typical form. The same may be said of the discal band of the secondaries. The underside is paler than that of the type-form, especially toward the anal angle of the secondaries.

Type ♂ in Hope Collection, Oxford: taken in some dense forest on the Kalungwisi river, 14.ix.08.

Uganda specimens would seem to be somewhat intermediate between *elabontas mweruensis* and *elabontas elabontas*.

CHARAXES BRUTUS NATALENSIS Staud.

Not rare throughout the Luangwa valley at all seasons. Also taken on Chishi Island, Lake Bangweolo, iv.

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* Exot. Butt. iv. pl. xxx. fig. 33.

CHARAXES PELIAS SATURNUS Butler.

A very common species throughout N.E. Rhodesia, less so in Katanga.

CHARAXES POLLUX GEMINUS.

Charaxes pollux geminus Rothsch. Nov. Zool. vii. p. 427 (1900).

A single male, captured on the Chambezi river, 13.iv.08.

CHARAXES DRUCEANUS Butler.

Represented by a single male, captured on the Alala plateau north-east of Broken Hill, ix. 1905. A somewhat dwarfed and not very typical specimen.

[CHARAXES PENRICEI.]

Charaxes penricei Rothsch. Nov. Zool. vii. p. 460 (1900).

I observed, but did not capture, what I believe to have been an individual of this species on the upper Kafue river, x. 1905.

CHARAXES ACHÆMENES Feld.

One of the most abundant species of *Charaxes*, occurring throughout the whole country. The females are, however, very rare in my experience.

CHARAXES LUCRETIUS Cram.

Represented by a single male taken on the Kalungwisi river, ix.

CHARAXES BOUETI LASTI Gr. Smith.

Not uncommon in the Luangwa valley during the wet season. In Katanga I took two males on the Lufupa river, xi., and one male in the Kalungwisi valley, N.E. Rhodesia, ix.

CHARAXES AZOTA Hew.

A somewhat uncommon species. I captured a pair on the Lualaba river, iv. and v., one female on the Chambezi river, iv., and one male on the Lofu river, viii.

CHARAXES ETHEOCLES Cram.

I took the males of this species over a wide area at all seasons, including the Luangwa valley. The females I found very scarce. Of the ♀ f. *phæus* Hew. I took one at Fort Jameson, iv., and one in Katanga on the Lualaba river, v. Of the ♀ f. *manica* Trim., I took three individuals in the neighbourhood of some forest between the Lofu river and lower Tanganyika, viii. These two forms of the female appear to mimic the male and female respectively of *Ch. bohemani* Feld.

CHARAXES GUDERIANA Dewitz.

This species occurs everywhere and at all seasons. It is probably the most abundant species of *Charaxes* throughout this part of Africa.

CHARAXES BOHEMANI Feld.

This species is not uncommon throughout the wooded areas in all parts of the country. It appears to be the most dominant of the larger *Charaxes*. It is an extremely wary insect, the female especially so, and flies and usually settles on tree-trunks, etc., a good deal higher than most of its congeners.

CHARAXES CITHÆRON Feld.

Represented by a single female captured in the Luangwa valley, vi. One or two other individuals were observed.

CHARAXES AMELIÆ Doumet.

I captured a single male of this fine species on the upper Kalungwisi river, ix. It was flying on the edge of some dense forest.

CHARAXES NICHETES LEONINUS Butler.

I observed a few individuals of this species throughout the high plateau country of N.E. Rhodesia. I only succeeded in capturing a few specimens, which are all males. It is astonishingly active even for a *Charaxes*. I took it more commonly in the lower Chambezi valley, x., than elsewhere.

CHARAXES VARANES Cram.

This species is on the wing at all seasons throughout the area under discussion. It is, however, nowhere very abundant.

CHARAXES ZOOLINA Dbl. & Hew.

This species, which Leigh * has recently shown to be the same species as *neanthes* Hew., is uncommon. I met with it only in the Luangwa valley, iii., taking one male of the *neanthes* form and a pair of *zoolina*.

[CHARAXES ZINGHA Cram.]

I observed, but did not succeed in taking, one or two individuals of this species, in the lower Lualaba valley, v., 1907.

FAM. LEMONIIDÆ.

ABISARA ROGERSI Druce.

I found this species not uncommon throughout the country west of the Mchinga escarpment. It frequents dense forest-thickets and has a feeble but restless flight.

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* Proc. Ent. Soc. 1908, p. lxiv.

Fam. LYCÆNIDÆ.

ALÆNA AMAZOULA Boisd.

I took this insect abundantly in the Luangwa valley, i.-iii. It chiefly frequents hillsides where there is some open woodland and short grasses.

ALÆNA AURANTIACA Butler.

A single female of this rare species was taken in May, to the east of Lake Bangweolo. It seems to be a distinct species from *A. hauttecœuri* Oberth.

ALÆNA NYASSÆ Hew.

This species is not uncommon in the Luangwa valley and to the east of it, especially in the Fort Jameson district. It only occurs during the wet season. It has much the same habits as *amazoula*, and where it occurs at all is usually in fair numbers.

ALÆNA RETICULATA Butler.

I captured two individuals of this species in the upper Luangwa valley, 17.iii.08.

ALÆNA OBERTHURI Auriv.

I took three individuals of this species in the Lualaba valley, iv. 1907. It is very inconspicuous on the wing and flies very near the ground.

TELIPNA NYANZA.

Telipna nyanza Neave, Nov. Zool. 1904, p. 335, pl. i. fig. 19.

I took two specimens of this species in dense forest on the Lubudi and Lufupa rivers, x. and xi.

PENTILA AMENAIDA Hew.

A very abundant insect in most localities during the wet season. It frequents woodland and wooded hills and has a weak but steady flight.

It is a highly variable species especially in the presence or absence of many of the spots. A few individuals have more or less, sometimes the whole, of the secondaries suffused with dusky on the upper surface.

PENTILA AMENAIDOIDES Holl.

One specimen captured at Kambove, iv., which I refer with some doubt to this species.

PENTILA PEUCETIA Hew.

I captured one individual of this species at Petauke in the Luangwa valley, i., and subsequently five others near Kambove, iii.

It is a very conspicuous insect with a weak flight. It often sits on a more or less exposed twig with wings folded above it.

In this attitude the bright sulphur-coloured legs exhibit a marked contrast to the black and white wings.

MIMACRÆA MARSHALLI Trim.

I took about twenty individuals of this fine species in the Lualaba valley, iv. and v., and one other later in the year, x. I also saw a few individuals in the Chambezi valley, iv. and v. These Central African specimens seem to be slightly more heavily marked than those from Mashonaland. I found its habits and the nature of its habitat very much as Marshall describes*, but did not observe it settling head downwards on the trunks as he records.

Text-fig. 2.

Mimacræa marshalli Trim., on a tree-trunk.

When in the Chambezi valley in May 1908, I was so fortunate as to obtain some photographs of this interesting species resting on a tree-trunk. I was also lucky enough to capture, on more than one occasion, both this species and *Pseudacræa poggei* as well as their model *Limnas chrysippus* within a few yards of each other.

MIMACRÆA SKOPTOLES.

Mimacræa skoptoles H. H. Druce, Trans. Ent. Soc. 1907, p. 78, pl. ii. fig. 3.

Of this rare and recently described species I took in Katanga one female on the Lualaba river, iv., and one male on the Lubudi river, x. In 1908 I took a second male on the Kalungwisi river, N.E. Rhodesia, ix. The male, which is apparently hitherto unknown, differs from the female in its smaller size and less rounded primaries. It has the subapical band narrower, and yellow instead of creamy white. On the under surface the black apical suffusion extends more than halfway down the cell to the base of the costa. All the under-surface markings of both sexes in the Katanga specimens are heavier than those of the type from Nigeria. I took this species only in dense forest. It looks exactly like an *Acræa* on the wing, but like *M. marshalli* settles on tree-trunks, which at once "gives it away" to the entomologist.

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* Trans. Ent. Soc. 1902, p. 172.

TERIOMIMA HILDEGARDA Kirby.

This species is common in woodland over a wide area from the beginning of the rains until April or May, being scarcer the last two months. I am rather inclined to think that it may prove to be the wet-season form of the next species.

TERIOMIMA ASLAUGA Trim.

This species, of which *T. pallida* Trim. is perhaps a very dry phase, occurs over a wide area, and is especially common in the Luangwa valley. It is on the wing from the end of March to August and I have taken one individual as late as November.

LARINOPODA TERA Hew.

Represented by a single specimen from the Lubudi river, x.

LIPTENA HOMEYERI Dewitz.

This species occurs locally in the Luangwa valley in March only. In Katanga I found it abundant from December to June. It always frequents woodland, and except for its somewhat deeper colour is hardly distinguishable from a *Terias* on the wing.

ASLAUGA PURPURASCENS Holl.

I took two specimens of this insect on the Alala plateau north-east of Broken Hill, xi., and one other in the Chambezi valley, v. *A. marshalli* Butler appears to be a very doubtfully distinct species, as Trimen* has already pointed out.

LACHNOCNEMA BIBULUS Fabr.

This species is ubiquitous and on the wing at all seasons.

LACHNOCNEMA DURBANI Trim.

This species also occurs everywhere but is less common than the foregoing.

PILODEUDORIX CÆRULEA H. H. Druce.

I took this species sparingly in a great variety of localities from

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* Trans. Ent. Soc. 1906, p. 81 note.

November to June. Strange to say, among ten specimens captured there are only two males.

DEUDORIX BEMBA, sp. n. (Plate II. fig. 12, ♀.)

In the general coloration of the under surface and in the absence of basal spots on the upper surface this species appears to be related to *Pilodeudorix cærulea* Druce, though the underside markings are quite distinctive.

♀. UPPERSIDE purplish blue with dusky margins; *a linear submarginal white line on outer margin and toward anal angle of secondaries; a long dusky tail on vein 2; anal lobe orange ochreous with a patch of black and metallic* blue scales toward *outer margin.*

UNDERSIDE pale greyish: on both wings a discocellular stria composed of a double row of fawn-coloured scales; a transverse discal ochreous line outlined externally with white across both wings, in primaries straight, in secondaries somewhat zigzagged in area 1 *c* and turned sharply toward inner margin at vein 1 *b*; a faint submarginal dark line outlined externally in whitish on both wings; in *secondaries* on outer margin in area 2 a clear black eye-spot, strongly outlined proximally with orange and with a minute spot of pale blue near vein 3; in area 1 *c* a patch of black and pale blue scales; anal lobe black with a few pale blue scales; from anal lobe a well marked orange-ochreous line extends for a short distance along inner margin.

Fringe dusky above, grey below; *palpi*, the basal segment white, the distal long, smooth and black; *thorax* above bluish; *abdomen* dusky above, paler below, at sides the edges of segments outlined in whitish.

Length of primary 15 mm.

Type in Hope Coll., Oxford. Luwingu, north of Lake Bangweolo, 2.vi.08. The only specimen met with.

DEUDORIX LICINIA Mab.

Represented by a single male taken in the Mbala country, between Fort Jameson and the Luangwa river, v.

DEUDORIX ANTALUS Hopff.

I found this species ubiquitous and occurring throughout the year.

DEUDORIX KAFUENSIS, sp. n. (Plate II. fig. 11, ♂.)

Allied to *D. elealodes* Beth.-Bak.*, but a larger insect with more rounded primaries and differing in some important points on both surfaces.

♂. UPPERSIDE.—*Primaries* deep blue with dusky costa, apex and outer margin. The deep blue suffusion, which is somewhat paler than in *elealodes*, does *not reach the costa* as in that species and *elealа* Hew.; a black linear discocellular streak; inner margin near base with a distinct lobe much more marked than in *elealodes.*

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* *Deudorix elealodes* Beth.-Baker, P. Z. S. 1908, p. 112, pl. ix. fig. 6.

Secondaries. Costal and inner margins dusky; remainder of wing flushed deep blue; anal lobe of medium size (much more marked than in *elealodes*), bright fulvous orange; a well marked whitish, black-tipped tail on vein 1 *b*, and a rudimentary one on vein 2. Between veins 1 *b* and 2 a well-marked sex-patch of long black hairs, much more developed than in *elealodes*.

UNDERSIDE.—Both wings whitish, with a linear pale ochreous discocellular streak.

In *primaries* a pale ochreous waved line from costa nearly to hind margin, lying about midway between cell-end and outer margin. This line is narrower, less straight and *much more distally* placed than in *elealodes*; a second less distinct, submarginal line of same colour lies parallel to outer margin, which is dirty whitish. A black sex-mark in area 1 *b* below cell-middle.

Secondaries have the two lines and margins as primaries. Between veins 2 and 3 a large black eye-spot surrounded by orange-ochreous; in anal lobe a minute black eye-spot outlined in metallic blue contiguous with a well-marked orange-red patch lying toward inner margin, on margin a narrow line of black from vein 6 to anal lobe.

Fringe grey on primaries, white on secondaries; *palpi* white, the terminal segment black; *thorax* above dark grey with a few pale blue scales and hairs; *abdomen* above dusky, laterally the segments edged with pale blue, below white.

Length of primary 16·5 mm.

The female differs from the male in being slightly larger and paler and in wanting the sex-marks.

♂ type in the Hope Coll., Oxford. Ndola district, upper Kafue, N.W. Rhodesia, 3.x.05.

♀ type and ♂ cotype in the British Museum. Kasama district, Chambezi valley, N.E. Rhodesia, 15.v.08.

Also three males and one female from the country east of Lake Bangweolo and the lower Chambezi. ix. and x.

DEUDORIX ZELOIDES Butler.

Virachola zeloides Butler, Ann. Nat. Hist. vii. 1901, p. 289.

One female from the upper Luangwa, 31.iii.08.

DEUDORIX CALIGINOSA Lathy.

Deudorix caliginosa Lathy, Trans. Ent. Soc. 1903, p. 197, pl. viii. fig. 7.

A single male captured on the east shore of Lake Bangweolo, v.

MYRINA FICEDULA Trim.

This species, though nowhere very abundant, occurs over the whole country and at all seasons.

PSEUDALETIS MAZANGULI, sp. n. (Plate II. fig. 6, ♀.)

Creamy white with black markings. Allied to *zebra* Holl.

♀. UPPERSIDE.—*Primary.* The ground-colour creamy white; costa dusky; base of wing dusky, narrowly so toward hind margin; a black band across middle of cell to median; a second black band across end of cell to vein 2, filling up angles formed by median and veins 2 and 3; a third black band from costa beyond end of cell to vein 3, where it becomes confluent with outer margin; a broad dusky outer margin from apex to posterior angle, where it is especially wide and black in colour.

Secondary. Creamy-white ground, with traces of underside discal row of spots in areas 2, 3, 4. A well-defined median black outer margin enclosing three small creamy-white spots at anal angle; black tails on 1 and 2, of which the former is the largest.

UNDERSIDE.—*Primary.* As upperside but outer margin narrower, at apex enclosing a narrow whitish line; at posterior angle much invaded by creamy-white ground-colour leaving only a mark like a ? in area 1 *b*.

Secondary. Ground-colour as upperside; a black streak extends from base along area 1 *b* for half its length and then turns sharply to inner margin; a discal line of confluent spots from costa ending in a narrow streak in area 2; black outer margin broken up into narrow marginal and submarginal lines enclosing band of ground-colour, flushed with ochreous on nervules 2, 3, 4 and in area 2. Anal lobe broadly covered with black scales enclosing a marginal and narrow submarginal line of silver ones.

Fringe dusky; *palpi*, which are very small, ochreous; *abdomen* banded black and white, in mid-ventral line a well-defined ochreous streak from head to anus.

Length of primary 25·5 mm.

Type ♀ in British Museum. Mazanguli's S. Kaluli river, Lualaba valley, Katanga, 23.iv.07.

This species seems most nearly allied to *P. zebra* Holl., but differs in many points as regards the distribution of the black markings.

HYPOLYCÆNA HATITA Hew.

This species occurs over a wide area, but is nowhere common. I found it least rare on the upper Kafue river, x., and in the same month on the lower Chambezi and Lake Bangweolo. It usually frequents the edges of patches of forest, generally high up in the trees, making it difficult to catch.

HYPOLYCÆNA LIARA H. H. Druce.

Occurs sparingly over a wide area. The females are scarce. Has somewhat the same habits as the last species.

HYPOLYCÆNA PHILIPPUS Fabr.

This is a common species almost everywhere.

HYPOLYCÆNA BUXTONI Hew.

Scarce in the southern part of the country and in Katanga. Not uncommon in the Lake Bangweolo district and on the Tanganyika plateau, vii.-xi.

HYPOLYCÆNA CŒCULUS Hopff.

A ubiquitous insect, which differs from most of its congeners in being a woodland and not a forest insect.

STUGETA BOWKERI Trim.

With the exception of one specimen taken on the upper Kafue, x., I met with this insect only in the Luangwa valley, where it occurred sparingly during the wet season.

STUGETA MARIA.

Stugeta maria Suffert, Deutsch. Ent. Zeit. "Iris," 1904, xvii. p. 60.

I took two females of this species (which is I think doubtfully distinct from the last) on the Lufupa river, x., and a pair in the Chambezi valley, x. 1908.

ARGIOLAUS SILARUS H. H. Druce.

I took a pair of this handsome insect on the Alala plateau, Broken Hill district of N.W. Rhodesia, x. and xi. It frequents the borders of dense forest, generally flying high amongst the trees, a habit which makes it difficult to capture.

EPAMERA SIDUS Trim.

Represented by a single female from the upper Kafue river, N.W. Rhodesia, x.

EPAMERA TRIMENI Wallengr.

Represented by one male from the Alala plateau, north-east of Broken Hill, xi., and two worn females from Fort Jameson, iii. and iv. Also a single male from the north-east of Lake Bangweolo, ix. The males are more brightly coloured than Mashonaland specimens, and the eye-spots at the anal angle are rather more marked, but the difference is only one of degree.

APHNIOLAUS PALLENE Wallengr.

I captured one individual of this curious species on the lower Zambezi, ii., one in the Luangwa valley, iii., and a third on the Alala plateau, ix. It seems to be extremely local though widely distributed. It is a woodland species.

APHNÆUS ORCAS Drury.

Two males from the Lualaba river, v. The specimens approximate to the form *hollandi* Butler.

APHNÆUS QUESTIAUXI. (Plate II. fig. 4, ♀.)

Aphnæus questiauxi Auriv. Arkiv Zool. 1903, i. p. 252.

I captured a pair of this fine species on the Alala plateau, north-east of Broken Hill, ix. Subsequently I found it not uncommon in the Kalungwisi valley and Lake Bangweolo district also in September. It frequents the edges of patches of forest and sometimes visits mud-holes. It seems to be on the wing only about the month of September. In the cool high plateau country this is the early spring of the year, though some time before the first rains.

The female of this species seems to be undescribed. It is larger, length of primary 24 mm. as compared with 18–21 mm. in the male. It has more rounded primaries which exhibit a submarginal flush of reddish chocolate on apex and outer margin; blue basal flush of primary somewhat more extensive than in male; abdomen dorsally covered with blue scales, not hairy as in male.

APHNÆUS ERIKSSONI Trim.

Represented by a single male from the Alala plateau, ix., and another solitary male taken in the same month north of Lake Bangweolo. These specimens differ somewhat from South-African specimens. The upperside apical spots and all the spots and markings of the under surface are much enlarged.

APHNÆUS MARSHALLI, sp. n. (Plate II. fig. 8, ♂.)

A distinct species, somewhat resembling *A. erikssoni* Trim. on the upper surface, but without the blue wash of that species.

♂. UPPERSIDE.-*Primary.* Rich chestnut-red; shoulder of costa same colour; rest of costa, apex, and outer margin narrowly blackish; a small semi-transparent discocellular spot; a subapical row of three whitish, dark-margined spots in areas 6, 5, 4, of which the last is darker than others and placed nearer outer margin; in some individuals this spot is evanescent, and in one where it is well-marked it is accompanied by similar spots in areas 2 and 3, making a row parallel to outer margin.

Secondary. Ground-colour as primary, of a duller colour on inner margin and anal lobe, which are covered with long hairs; outer margin narrowly dusky; anal lobe bears a deep ferruginous tail.

UNDERSIDE.—*Primary.* Ground-colour rich fawn, paler toward hind margin, bearing the following silver marks and spots, outlined in black and again more irregularly in ferruginous:—one spot above costa at base, another below it in cell; a streak across middle of cell; a discocellular streak; two confluent subapical spots in areas 5 and 6, the latter slightly invading areas 8 and 9; a small spot in area 4 nearer outer margin than last; an indefinite submarginal spot in 1 *b* and a still fainter one nearer base in same area (in some specimens the former of these is a definite streak extending from 1 to 2; there may also be two additional spots in 2 and 3 and a minute one at junction of 2 with median); a somewhat faint row of small ferruginous submarginal internervular spots; the dusky outer margin linear only.

Secondary. Ground-colour as primary with following similar spots:—one above base of costa; one at base of wing near hind margin; a row of three spots before the middle, the first large and circular above middle of cell, the second smaller within cell, the third on inner margin; a large irregular discocellular and a small spot below it in area 1 *c*. Beyond middle an oval spot below costa; a smaller one immediately below it and contiguous to it in area 6; two spots in 2 and 1 *c*, the former larger and placed nearer outer margin, followed by a stripe extending from 1 *b* to inner margin; at base of anal lobe on inner marginal side, a small irregular patch of silver scales divided from a spot of chocolate-purple on the inner marginal side of the lobe itself by some golden-yellow scales; outer margin as primary, with a similar indistinct row of internervular submarginal ferruginous spots; tail as upperside.

Fringe of primary grey, of secondary with internervular white patches; *palpi* white tipped with ochreous; *thorax* above covered with long golden-brown hairs; *abdomen* dark brown, whitish in mid-ventral line.

Length of primary 18 mm.

Type ♂ in the British Museum, from the upper Lofu valley, Tanganyika plateau, about 40 miles south of the Lake, 26.viii.08. Cotypes in the Hope Coll., Oxford.

I captured four individuals of this species in all, two on the upper Kafue river, ix., and two in the upper Lofu valley at the end of August and beginning of September. It usually frequents flowers, etc. on the outskirts of dense forest. One individual was taken at damp mud. I have dedicated this species to my friend Mr. Guy A. K. Marshall, who originally captured a damaged individual of this species at Mazoë, in Mashonaland, so long ago as September 1894, which specimen is now in the collection of Mr. Roland Trimen.

SPINDASIS PHANES Trim.

I took this species sparingly in the Luangwa valley, i. and iii., but not elsewhere.

SPINDASIS NATALENSIS Dbl. & Hew.

Represented only by three specimens from the Luangwa valley, i. and ii.

SPINDASIS NYASSÆ Butler.

This species occurred sparingly in the Luangwa valley, i.–viii. I found it fairly common in the Chambezi valley and the Lake Bangweolo district, iv.–vii.

SPINDASIS VICTORIÆ Butler.

This species is not uncommon in the Luangwa valley during the wet season. With the exception of one specimen captured between the Luangwa river and Broken Hill, I did not meet with it elsewhere.

SPINDASIS TRIMENI, sp. n. (Plate II. fig. 7, ♂.)

Allied to *S. natalensis* and *victoriæ**, but differs from these species in the apical markings of the primaries, the orange colour being reduced to three somewhat rectangular spots and never forming bars.

♂. UPPERSIDE.—*Primaries.* Basal portion of inner marginal area pale glistening blue extending upwards into base of cell; a black bar projecting from costa across middle of cell; a white bar (outlined in orange toward costa) a little before cell-middle, extending into base of area 2 as a white or orange-washed whitish spot; costa, apex, and outer margins blackish, enclosing 3 well-defined orange spots; the first nearly rectangular, lying beyond end of cell; the second somewhat triangular, lying in apex near margin in area 5 (sometimes invading, a little, areas 6 and 4); the third spot, the largest, placed submarginally in areas 3 and 2.

Secondaries. Pale blue with dark costal and outer margins, the latter double and reduced in size toward anal angle. In anal lobe a pale sulphur-yellow patch, edged toward outer and inner margins with a few black and silver scales; tails on veins 2 and 1 *b* (the latter the longer) black, orange at base with a small white tip.

UNDERSIDE.—In a fresh specimen pale sulphur-yellow with transverse fasciæ outlined in black or dark reddish-brown with central dull steel-coloured streaks. *Primaries*: a basal spot with steel centre; a fascia from costa across cell-middle ending in an extensive dusky patch on inner margin; a second fascia from costa across cell-end to near posterior angle where it breaks off into a dark line; this fascia is broken at the median vein by a dark line; a small steel-centred spot on costa beyond cell-end; a third fascia, starting on costa transversely, *turns abruptly toward outer margin at vein* 4; an elongated spot in area 3 near cell-end connects the 2nd and 3rd fasciæ, and so sometimes forms a branch of the former of these fasciæ; two submarginal dark lines (the outer one rather indefinite) connected with dark linear outer margin by dark lines on the veins.

Secondaries coloured as primaries, the markings much as in *S. victoriæ* Butler, especially as to the basal spots and broken main fascia, which, starting from costa, extends to near anal lobe and then turns sharply toward inner margin. The second and outer fascia however differs, beginning near origin of the first it slopes toward outer margin, the two fasciæ *not* being nearly *parallel* as in *victoriæ*; an additional spot below costa, a little distal to, and sometimes confluent with, the origin of the second fascia; only a trace of orange at base of anal lobe; the tails as upperside, but anal lobe on inner marginal side more strongly black. A well-marked line of long dark hairs between veins 1 *b* and 2 (very slightly developed in female). This seems to represent the rudiment of the primitive 3rd internal nervure.

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* *S. victoriæ* Butler. Ent. M. Mag. xx. p. 251.

Palpi pale yellow; *thorax* and base of *abdomen* above covered with pale blue hairs, remainder of *abdomen* pale yellow, outlined on edge of segments with reddish chocolate.

Length of primary 18 mm.

The female differs in having more rounded wings; in the primaries the basal white cell-band is more extensive, and the second and third orange spots near outer margin are more extensive and confluent, forming an irregular submarginal band.

Type ♂ in the British Museum: upper Kalungwisi valley, 9.ix.08. Type ♀ in the Hope Coll., Oxford: Lofu river, 8.viii.09. Described from 18 males, 5 females.

This species occurred sparingly from the Chambezi valley to near Lake Tanganyika, iv. ix.

SPINDASIS MOZAMBICA Bert.

This is a common species at all seasons. It seems to occur everywhere.

SPINDASIS HOMEYERI Dewitz.

This is a very common species throughout the high plateau country. The dry-season specimens of this species have the markings of the underside reduced and the ground-colour much darker. *S. kallimon* H. H. Druce * appears to be figured from an extreme wet-season specimen of this species.

SPINDASIS CRUSTARIA Holl.

Represented by a single male from the Alala plateau, which is somewhat paler above, having a marked basal wash of pale blue and less heavily marked below than in specimens from the tropical West Coast, and possibly represents a new race.

SPINDASIS sp. near ADERNA Plötz.

Two females from the upper Kafue river allied to the above species, but in absence of males I hesitate to describe them. They are larger insects, altogether paler than the females of *aderna*, the whole discal area and primaries and whole of secondaries being uniform orange without any dark markings.

ZERITIS SORHAGENI Dewitz.

I captured three individuals, two males and one female, of this rare species near Kambove, Katanga, iii. I saw, but did not take, another on an open plain on the upper Lufupa river, x. It frequents open country and flies, not very strongly, near the ground.

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* Trans. Ent. Soc. 1905, p. 254, pl. xii. fig. 9.

AXIOCERCES HARPAX Fabr.

AXIOCERCES AMANGA Westw.

These two species are ubiquitous and on the wing at all seasons.

LEPTOMYRINA LARA L.

I took this species in some numbers in one spot in the Luangwa valley, viii., but did not meet with it elsewhere.

CAPYS DISJUNCTUS Trim.

I took four males and two females of this species on high plateau both north and south of the Lofu valley, Tanganyika plateau, viii. and ix., also one female on the east of Lake Bangweolo, v. It frequents flowers, etc., on the outskirts of dense forest. The males are somewhat intermediate between typical *disjunctus* and var. *connexivus* Butler *.

PHASIS LEROMA Wallengr.

I captured a solitary male of this species in the lower Chambezi valley, 25.x.08. This seems to extend its range considerably further north than it has hitherto been recorded.

SPALGIS LEMOLEA H. H. Druce.

Represented in the collection by a female captured at Kambove, iii., and a male on the Chambezi river, iv. It is a forest species.

LYCÆNESTHES AMARAH Guér.

A very common species in the Luangwa valley at all seasons, but scarce to the west of the Mchinga escarpment, and not met with at all in Katanga.

LYCÆNESTHES SYLVANUS Drury.

A single male from the Lubudi river, Katanga, x.

LYCÆNESTHES MINIMA Trim.

I took four individuals of this apparently rare little species in the Ndola district, upper Kafue river, N.W. Rhodesia, x.

LYCÆNESTHES LUNULATA Trim.

This species seems to be ubiquitous and to be on the wing at all seasons.

LYCÆNESTHES SANGUINEA.

Lycænesthes sanguinea B.-Bak. Trans. Ent. Soc. 1910, p. 41.

I found this handsome species, which might at first sight be mistaken for the preceding, quite common on the high plateau country of the watershed and near Lake Bangweolo. I did not take it in Katanga or in the Luangwa valley. I incline to the view that it may prove to be the dry phase of *lunulata*.

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* P. Z. S. 1896, p. 831, pl. xli. fig. 6.

LYCÆNESTHES OTACILIA Trim.

Represented by one specimen captured in the Zambezi valley at the mouth of the Luangwa river, v., and one from the upper Luangwa valley, iii.

LYCÆNESTHES PRINCEPS.

Lycænesthes princeps Butler, Ann. N. H. xviii. p. 484 (1876).
Lycænesthes neglecta Trim. Trans. Ent. Soc. 1891, p. 175.

Though nowhere abundant I met with this species over a wide area in N.E. Rhodesia.

LYCÆNESTHES MILLARI Trim.

Represented by a single female from the Lofu river, Lake Tanganyika, viii.

LYCÆNESTHES LASTI Sm. & Kirby.

This is a forest species of which I took several on the Lufupa river, x. and xi., and again in the valleys of the Kalungwisi and Lofu, viii. and ix., and the Lake Bangweolo district, x.

LYCÆNESTHES ANADEMA.

Lycænesthes anadema H. H. Druce, Trans. Ent. Soc. 1905, p. 258, pl. xiii. fig. 6.

Represented by two specimens captured near Mporokoso, viii.

LYCÆNESTHES PHŒNICIS Karsch.

I found this species, which seems very rare in collections, not at all uncommon over a wide area in the high plateau country of Northern Rhodesia.

LYCÆNESTHES LEVIS Hew.

Two males from the plateau country north of Broken Hill, ix. and xi. 1905, and one male from the Chambezi valley, x. 1908.

LYCÆNESTHES NIGROPUNCTATA.

Lycænesthes nigropunctata B.-Bak. Trans. Ent. Soc. 1910 p. 36.

I found this species not uncommon throughout the high plateau country of N.E. and N.W. Rhodesia from the upper Kafue river to near Lake Tanganyika, iv.–x.

LYCÆNESTHES LIODES Hew.

Luangwa valley, Petauke, one in January, one in August; not met with elsewhere.

LYCÆNESTHES CRAWSHAYI Butler.

Lycænesthes crawshayi Butler, Ann. N. H. (7) iv. p. 342 (1899).

This seems to be a common species everywhere except in the Luangwa valley. It is quite the most abundant *Lycænesthes* of this type.

LYCÆNESTHES LIGURES Hew.

A single male from the Lubudi river, x.

LYCÆNESTHES DEFINITA.

Lycænesthes definita Butler, Ann. N. H. iv. p. 342 (1899).

This species is not uncommon throughout the high plateau which forms the Congo-Zambezi watershed from the Kafue river to Lake Tanganyika.

LYCÆNESTHES LARYDAS Cram.

I took isolated specimens of this species over a wide area from the Luangwa valley to Katanga. It seems to be a forest species.

LYCÆNESTHES GEMMIFERA, sp. n. (Plate II. fig. 5, ♂.)

This remarkable little species, which I assign with some doubt to the genus *Lycænesthes*, is distinguished at a glance by possessing a row of four eye-spots on the outer margin of the underside of the secondaries. In the general distribution of the markings, in fact in all other points including the presence of small tails on the vein-endings on the secondaries, it closely resembles other species of that genus.

♂. UPPERSIDE uniform, bronze-brown. On outer margin of *secondaries* the eye-spots of underside show faintly through as dark spots. Short whitish tails on veins 1 *b*, 2, 3, more rudimentary ones on 4 and 5.

UNDERSIDE greyish brown with darker striæ outlined in grey.

Primaries. The following striæ:—a discocellular, an irregular discal row of striæ, placed very near submarginal area, except that below costa; an additional short wide stria in area 1 *b* rather more proximally placed, margin broadly greyish interspersed with semilunar marks of the darker ground-colour.

Secondaries. Two well-marked large dark spots below costa outlined in grey; a small spot on inner margin near base; an indistinct stria at base of cell; a discocellular stria; a discal row of striæ from outer costal spot to inner margin lying more proximally in area 1 *c*; submarginal area grey, with dark semilunar internervular marks; on outer margin in areas 5, 4, 3, 2, *four* clearly marked black eye-spots outwardly marked by a semicircular line of greenish silver; between each spot on vein-ends an orange streak; towards anal angle in area 1 *c* two, in 1 *b* one black spot with some scattered greenish silver scales; at end of vein 1 *b* a trace of an orange streak.

Fringe grey; *palpi* long and grey, the base only hairy; *thorax* and *abdomen* above dusky, below grey.

Length of primary 11 mm.

Type ♂ in Hope Coll., Oxford: Petauke, Luangwa valley, 16.iii.05.

Cotype ♂ in the British Museum: upper Kalungwisi valley, 7.ix.07.

The above two specimens of this striking species, with the addition of a third from east of Lake Bangweolo, x., were the only ones met with, though the localities are several hundred miles apart. They were all captured in rather open spots at damp mud, among a number of other Lycænidæ.

PHYLARIA HERITSIA Karsch, f. VIRGO Butler.

A species which occurs sparingly throughout the high plateau country of N.E. Rhodesia and Katanga, x. and xi. It seems to be absent from the Luangwa valley. It frequents the edges of forest.

URANOTHAUMA ANTINORII Oberth.

This species seems to be nowhere common, but I took it occasionally throughout the plateau country and Katanga, ix. and x.

URANOTHAUMA NUBIFER Trim.

Represented by only two males from some forest on the Tanganyika plateau between the Lofu river and the lake, viii.

URANOTHAUMA POGGEI Dewitz.

This is a common plateau species largely replacing the next. Like its congeners it frequents the banks of streams and damp places, usually in the neighbourhood of forest.

URANOTHAUMA FALKENSTEINI Dewitz.

I found this species not uncommon in the Luangwa valley and sparingly in Katanga. I did not meet with it on the high plateau.

CACYREUS LINGEUS Cram.

This species is ubiquitous and on the wing all the year.

CASTALIUS SYBARIS Hopff.

This species occurs sparingly throughout the year in the Luangwa valley. I also took one specimen at Kambove, vi., but did not meet with it elsewhere.

CASTALIUS HINTZA Trim.

I found this species sparingly over a wide area, but did not meet with it in the Luangwa valley.

CASTALIUS CALICE Hopff.

This species seems to be ubiquitous and occurs at all seasons.

CASTALIUS MELÆNA Trim.

This species, which seems to be doubtfully distinct from the last, occurs nearly everywhere simultaneously with *calice*, but, strange to say, seems to be absent from the Luangwa valley, although *calice* is common there.

CASTALIUS ISIS Drury.

I met with this species only in Katanga, where it was not uncommon. It delights in hot, dry, and bare spots.

TARUCUS TELICANUS PLINIUS Fabr.

This species is everywhere enormously abundant. Ninety per cent. of the large numbers of small Lycænidæ at mud-holes were generally of this species.

TARUCUS PULCHER Murray.

Lycæna pulchra Murray, Trans. Ent. Soc. 1874, p. 524, pl. x. fig. 7 non 8.

I find in the collection eight males and six females of what I believe to be this species. It is impossible to say with certainty, as Murray does not figure the underside of the male and has figured as the female of the species one of the highly marked females of the common *telicanus* Lang. My specimens agree with the figure of the male in their uniformly small size and peculiar amethyst tint on the upper surface. The underside markings are always of a pale fulvous colour, never dusky, and the striæ are more broken up and rounded than in *telicanus*, and in the secondaries the markings within the submarginal line are more or less evanescent. The females agree closely with the males in the above-mentioned differences from *telicanus*, and have in a reduced form the same amethyst wash on the upper surface and the same small size. They are somewhat whiter on the upper surface than those of *telicanus*. I took this species over a fairly wide area, chiefly in low-lying river-valleys. It occurs mixed up with *telicanus*, and was especially common on Lake Bangweolo.

AZANUS MORIQUA Wallengr.

Azanus sigillatus Butler *.

AZANUS JESOUS Guér.

Both these species, especially the latter, seem fairly common everywhere.

AZANUS MIRZA Plötz.

I found this a common species in the Luangwa valley. Scarce on the plateau and absent from Katanga.

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* For this synonymy, *vide* Trimen, Trans. Ent. Soc. 1906, p. 79 note.

NACADUBA SICHELA Wallengr.

A very common species, somewhat scarce during the dry season. It may often be seen in very large numbers at damp mud.

POLYOMMATUS BŒTICUS L.

This species is ubiquitous. It varies a good deal in size.

CYCLYRIUS NOQUASA Trim.

Represented by a single male from the north of Lake Bangweolo, vii.

CATACHRYSOPS MALATHANA Boisd.

A very common insect throughout the country.

CATACHRYSOPS SKOTIOS H. H. Druce.

Catachrysops skotios H. H. Druce, Trans. Ent. Soc. 1905, p. 259, pl. xiii. f. 12.

Three males and one female of this species from the Lubudi and Lufupa rivers, ix. and x.

I also captured a very long series of specimens in the Chambezi valley, x. 08, which are doubtfully attributed to this species; they are larger and rather paler than the type. Most of the males exhibit on the upper surface a trace of the eye-spot at the anal angle of the primaries, which is not figured in the type. The females are larger, paler, and have a slight blue iridescence on the upper surface.

CATACHRYSOPS DOLOROSUS Trim.

I found this small species scarce, possibly it was often overlooked. I took one individual in the Luangwa valley, i., two in the Serenji district, ix., and three others in the upper Lofu valley, viii. and ix. I ultimately found it pretty common in the Chambezi valley, x. and xi.

CATACHRYSOPS ALBISTRIATUS Capronn.

A single male from Kambove, ii., and a female from near Lake Young, Chambezi valley, at the end of October.

CATACHRYSOPS PROCERUS Trim.

I captured two males of this rare species on the plateau to the north of Broken Hill, ix. and x., and two more during the same months in the country east of Lake Bangweolo, near the mouth of the Chambezi.

CATACHRYSOPS OSIRIS Hopff.

This is a common species everywhere.

CATACHRYSOPS BARKERI Trim.

Represented only by one female from the Luangwa valley, iv., and a pair in the same month from Kambove.

CATACHRYSOPS PATRICIA Trim.

I found this species sparingly in the wet season in the Luangwa valley and also on the Lufupa river, x. and xi.

CATACHRYSOPS GLAUCA Trim.

I captured a few individuals of this species at Fort Jameson and in the lower Luangwa valley, iii. Subsequently I took a good series in the upper Luangwa valley, ii. and iii. Central African specimens are of a pale grey greenish-glossed tint without the blue shade of South African ones.

CATACHRYSOPS CELÆUS Cram.

A single male from S.E. Katanga, xi., which I assign with some doubt to this species.

CATACHRYSOPS PAMPOLIS.

Catachrysops pampolis H. H. Druce, Trans. Ent. Soc. 1905, p. 258, pl. xiii. fig. 11.

Represented by a single male from the upper Lubudi river, x., and another in the same month from the lower Chambezi.

CATACHRYSOPS GIGANTEUS Trim.

I took a long series of this fine species near Petauke, Luangwa valley, during the wet season. It appears to have two broods, one at the end of December and another in March. It frequents woodland and wooded hills and has a powerful flight, during which its white black-spotted underside is rather conspicuous. A female of this species from the Victoria Nyanza was described by Butler as the female of his *hypoleucus*, which itself is a synonym of *peculiaris* Rogenh.

CATACHRYSOPS STORMSI Robbe.

I took four specimens of this species on the Lufupa river, xi. It may be distinguished at once from the last by its lack of tail.

CATACHRYSOPS CUPREUS, sp. n. (Plate II. figs. 9 ♂, 10 ♀.)

A very distinct species, at once distinguished by the golden-bronze colour of the males. The females somewhat resemble those of *C. peculiaris** Rogenh.

♂. UPPERSIDE shining golden-bronze with linear black margins to both wings. Also a well-marked black discocellular spot in *both primaries* and *secondaries*, a character not present in allied species: toward anal angle, eye-spots in areas 2 and 1 *c*, that in the former area the better marked, the black pupil being inwardly outlined and partially overlaid with pale blue scales, and the whole again being outlined with a white iris; eye-spot in area 1 *c* much less definite, partially lacking the blue colour, and the dark indistinct pupil has a tendency to be paired; a well-marked short, stout, black tail on vein 2.

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* *C. peculiaris* Rogenh. in Baumann's 'Usambara,' p. 331.

Underside whitish with black spots. An ochreous flush at base and along costa and outer margin of primaries and whole of secondaries, also some faint submarginal markings of a brighter orange colour and a black linear outer margin to both wings.

Primaries. The following black spots and striæ outlined in whitish:—an elongate discocellular; a discal row of six small elongate spots, the third, that in area 4, being placed more distally and at a different angle to the others, the last spot, that in 1 *b*, being small and sometimes paired.

Secondaries. With the following black spots and striæ outlined in whitish: —a large spot below costa above cell-middle, a spot in middle of cell, a small spot on inner margin near base; a discal row of eight black somewhat elongate spots around cell-end from costa to inner margin, the first, that in area 7, being very large; those in areas 3 and 2, of which the former is very small, placed nearer cell than the remainder; the penultimate, that in area 1 *c*, more elongate and more distally placed. Eye-spots in areas 2 and 1 *c* much as upperside, but that in area 2 has a complete blue iris and is secondarily strongly outlined externally with black.

Fringe dusky; *palpi* white tipped dusky; *thorax* and *abdomen* dusky above, paler below (the vertex tinged with bronze).

Length of primary 22 mm.

The female is a larger insect, primary 24 mm. The golden-bronze colour of the male is lacking and the upper surface is washed with pale blue, and there are traces, especially in the secondaries, of a submarginal row of whitish arrow-shaped markings. A variable number of the discal row of spots on the secondaries is visible on the upper surface. In the type specimen figured, these are seen in areas 4 and 5. The eye-spots on the upper surface are faintly outlined with orange-ochraceous. The under surface resembles that of the male, but is paler. There is sometimes an additional black spot immediately below the cell-middle in area 1 *c*.

Types ♂ ♀ in the British Museum, from the Mansya river near Lake Young, 5.xi.08.

Cotypes in the Hope Coll., Oxford.

Described from eleven males and thirteen females from the Chambezi valley and Mansya river, mid-October–mid-November, 1908, and one worn female from the Lufupa river, 26.x.07.

This striking species seems most nearly allied to *C. peculiaris* Rogenh. in the distribution of its markings, agreeing with *C. gigantea* Trim. in the possession of a tail. Apart from the colour of the male, it differs from allied species in the blue, not orange, colour of the eye-spot and in the possession of a discocellular spot on the upper surface of the secondaries.

This species has a fairly strong flight, and it frequents open country on the edge of patches of woodland.

CHILADES MAHALLAKOAENA Wallengr.

I have a long series from many localities which I place under this name with some doubt. The only two typical males were taken on the Alala plateau, ix., and in the Chambezi valley, x. From further north and west, though the females seem indistinguishable, the males, instead of being flushed with amethyst-pink as in typical *mahallakoaena*, do not differ in coloration from the females.

CHILADES TROCHILUS Freyer.

A common and ubiquitous species. It seems to prefer dry and exposed spots.

CHILADES UNIGEMMATA Butler.

Zizera unigemmata Butler, P. Z. S. 1865, p. 630, pl. xxxv. figs. 4, 5.

Two specimens, which, except that they have a very much paler underside, closely agree with the type of this species. They were captured in the upper Lofu valley, viii. and ix.

CUPIDOPSIS HIPPOCRATES Fabr.

A scarce insect on the low ground of the Luangwa valley or the river valleys of Katanga. Common on the high plateau.

EVERES MICYLUS Cram.

An uncommon insect taken occasionally in the upper Kafue, Lualaba, Chambezi, and Lake Bangweolo districts.

NEOLYCÆNA CISSUS Godt.

A fairly common species everywhere. It is on the wing all the year.

NEOLYCÆNA JOBATES Hopff.

I found this an uncommon insect in the Luangwa valley and on the upper Kafue river, but did not meet with it elsewhere.

ZIZERA ANTANOSSA Mab.

I found this species of *Zizera* rare, and only took one specimen on the upper Kafue river, x., and three others on the upper Chambezi river, iv.

ZIZERA GAIKA Trim.

This small species is ubiquitous.

ZIZERA LYSIMON Hübn.

This species is ubiquitous and much the most abundant of its genus.

ZIZERA LUCIDA Trim.

This species occurs over a wide area and throughout the year, but I did not find it common anywhere except in the Chambezi valley and Lake Bangweolo district.

Fam. PIERIDÆ.

PSEUDOPONTIA PARADOXA Feld.

I found this peculiar insect not very rare on the Lufupa and Lubudi rivers, x. It frequents dense forest and the thick bush on stream-banks, etc., and much resembles *Leptosia medusa* on the wing.

LEPTOSIA MEDUSA Cram.

This species is ubiquitous, but not very abundant anywhere. It frequents forest and thickets chiefly on low ground, and it is perhaps most common in the dry season.

HERPÆNIA ERIPHIA Godt.

Occurs everywhere and at all seasons, but is nowhere very abundant. Has a strong and active flight.

MYLOTHRIS AGATHINA Cram.

A ubiquitous species and much the most abundant of its genus.

MYLOTHRIS RÜPPELLI Koch.

Common everywhere, except in the Luangwa valley where it is somewhat scarce.

MYLOTHRIS YULEI Butler.

I took a small series of this species on high plateau country during the dry season. Some specimens, especially from Katanga, have a considerable amount of orange flush at the base of the primaries and a rather different apex. They perhaps represent a distinct species.

MYLOTHRIS RUBRICOSTA Mab.

This species occurs over a wide area in localities suited to it. It frequents open marshy ground and river banks when not obscured by timber, etc., and has a rather weak flight.

APPIAS EPAPHIA Cram.

This species occurs everywhere and at all seasons. It is nowhere very abundant, the females being especially scarce.

BELENOIS GIDICA Godt.

A common insect everywhere, and may often be seen in hundreds at mud-holes. The dry season form *abyssinica* Lucas is, during its season, more common if anything than the wet phase.

BELENOIS SEVERINA Cram.

A very common species which, although it comes into the open at times, is much more addicted to shade than its allies.

BELENOIS MESENTINA Cram.

Another ubiquitous species which is on the wing throughout the year.

BELENOIS CRAWSHAYI Butler.

I took at Kambove, vii., the upper Kafue river, x., Lake Bangweolo, vi., vii., a good many individuals, some of which, especially the Kambove ones, are certainly referable to the above species. Until the whole *zochalia* group of *Belenois* is more thoroughly worked out, it is not possible to make any definite statements, but it would seem likely that *B. formosa* Butler will prove to be the wet phase of *crawshayi*, and that Butler was in error * in assigning to *crawshayi* as its dry phase his own *diminuta*. Amongst my material there would appear to be also a small species allied to *diminuta*, but probably distinct from it. In the absence of more material and of any females I do not think it advisable to describe it.

B. crawshayi usually frequents open grassy country and may not unfrequently be taken at damp mud.

BELENOIS CRAWSHAYI, f. LATA, f. nov. (Plate III. fig. 3, ♂.)

Allied to *crawshayi* Butler, but differing chiefly in larger size, especially in the great breadth of the primaries and elongation of the secondaries. The markings are similar to those of *crawshayi*, but all the specimens have a more or less well-marked basal flush of orange-yellow on the underside of the primaries, a character which seems at least uncommon in that species. A single male from near Kambove, iv., which appears to be the wet phase of this form, is slightly smaller, and somewhat resembles the type of *B. formosa* Butler, which, as has been just stated, is possibly the wet phase of *crawshayi*. It is, however, a considerably larger insect with much heavier markings on the upperside of the secondaries, the under-surface markings being less extensive but much better defined. There is also a strongly marked orange streak on costa and a second more yellow one beyond end of costa, also faint intermarginal patches of very pale yellow around outer margins. Length of primary 30–35 mm.

Type ♂ in the British Museum: Lufupa river, Lualaba district, 14.x.07.

Cotypes in the British Museum and Hope Coll., Oxford.

Described from six males, all dry-season, Lufupa and Lubudi rivers, x. One male, wet phase, upper Dikulwe valley, iv.

BELENOIS DENTIGERA Butler.

I captured three specimens only of this species: a pair from the

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* P. Z. S. 1896. p. 851.

Lualaba valley, iv. and v., and a single male from the Bunkeya river, north of Kambove, viii.

Belenois picta, sp. n. (Plate III. figs. 1 ♂, 2 ♂.)

This species exhibits some points of resemblance with *B. thysa* Hopff., in the almost evanescent discocellular spot to the primary and the orange-yellow basal flush on the underside of that wing, but on the whole seems to be nearest to *B. theora* Dbl., in general distribution of its markings. With the exception of *theora*, it differs from all the truly African species of the genus that I can find described, in the presence of an *orange-yellow* discocellular spot on the underside of the secondary. This character may, however, be seen in *B. grandidieri* Mab., from Madagascar. Dr. F. A. Dixey informs me of the interesting fact that in the case of *theora*, the yellow discocellular spot is present only in West Coast specimens, *not* in those from the Congo.

Type ♂, wet-season.

Upperside.—*Primary*. Creamy-white, the base dusted with a few black scales. A minute black discocellular line may or may not be present; costa narrowly black; a well marked apical and outer-marginal black area enclosing six internervular white streaks; this black margin projects inwardly in area 3, and is continued to posterior angle by a large spot at end of vein 2 and a smaller one on vein 1.

Secondary. Base and ground-colour as primary; a submarginal row of small internervular black spots, those in areas 4 and 1 *c* usually evanescent; a marginal row of seven large black spots on ends of veins, those on 7 and 1 *b* the smaller.

Underside.—*Primary*. Ground-colour as upperside, the base with an ochreous flush, sometimes of considerable extent; black apex replaced by a subapical row of four spots of which third from costa is the largest, and by a marginal row of spots on ends of veins extending to posterior angle; a large submarginal spot in area 3 (the largest spot on the wing); whitish ground-colour of apex marked by internervular streaks of pale sulphur-yellow.

Secondary bears a costal streak of bright vermilion (occasionally orange-coloured); base of wing flushed with orange, of varying extent, radiating from base along internervular spaces, especially marked in area 1 *c*. *A well-marked orange-yellow discocellular spot*; marginal spot much as upperside, but submarginal row of spots better developed and joined to margin by rays of orange-yellow.

Fringes of both wings black with white patches on the internervular spaces; *palpi* covered with white hairs tipped dusky; thorax and abdomen whitish.

Length of primary 31·5 mm.

Type ♂ in British Museum, from 150 miles west of Kambove, near the Lufupa river, xi. Cotypes in Hope Coll., Oxford.

The dry-season male is a smaller insect, length of primary 27–28 mm. It has all the markings somewhat reduced, but is specially characterised on the underside by a violaceous wash on the apex of the primary and over the whole of the secondary. This wash fades after death to a warm greyish. The vermilion costal streak is intensified, but the orange-yellow basal flush and black marginal spots are much reduced.

The females of this species are of a pale yellowish colour with very heavy black margins to both wings. In some specimens the only spots of upperside of secondary, not merged in the margin, are those in areas 5 and 6. In one individual, the ground-colour on both surfaces is of a bright orange. In wet-season specimens, the orange-yellow flush of the under surface is very extensive, sometimes in the secondaries extending over nearly the whole wing. The dry-season phase has the same characteristic difference as in the males.

This species, which is described from 67 males and 5 females, occurred pretty commonly through the western portion of Northern Rhodesia from the Kafue river as far north as Lake Bangweolo and throughout Katanga. It is most common in the more open parts of high plateau country, and is frequently seen at damp mud, the females usually occurring in the denser woodland.

BELENOIS THYSA Hopff.

A common species in Katanga, much less so in N.E. Rhodesia. Usually frequents woodland.

PINACOPTERYX SIMANA Hopff.

This species is common in the low-lying parts of the Luangwa valley, iv.–ix. It frequents thickets and is particularly numerous in hot and dry country.

PINACOPTERYX ASTARTE.

Pinacopteryx astarte Butler, P. Z. S. 1899, p. 971, pl. lxx. figs. 6, 7.

I have a long series of this species, the identification of which I owe to my friend Dr. Dixey, taken at all seasons throughout the area under discussion. The series includes those specimens mentioned by Dixey in Proc. Ent. Soc. 1907, pp. lxv, lxvi. The females, especially the wet-season ones, are exceedingly difficult to distinguish from *Mylothris agathina* Cram., when on the wing.

TERACOLUS CHRYSONOME Klug.

Only represented by two males captured in the upper Chambezi valley, iv., and one lower down the same valley, x.

TERACOLUS VESTA Reiche.

This species usually occurs in hot low-lying localities and is rare on the high plateau.

TERACOLUS CELIMENE Lucas.

This species was observed only in the lower Luangwa and mid-Zambezi valleys, and then only in the dry season. It frequents extremely hot and dry spots, such as rocky hillsides, etc. It is active and restless on the wing.

TERACOLUS ERIS Klug.

This species is common everywhere, the males especially having a swift and active flight.

TERACOLUS PHLEGYAS Butler.

I met with this species only in the Luangwa valley, and then only at the lowest part of it, under 2000 feet elevation. Above this it seems to be replaced by the next species.

TERACOLUS REGINA Trim.

This handsome species, especially in the wet season, is common everywhere except, as mentioned above, in the lowest ground in the Luangwa valley. It has a powerful flight, and is not at all easy to catch. When it is abundant, a dull cool morning gives the collector the best chance as, like other Pierinæ, it is much influenced by the weather. The dry-season females are remarkable for having acquired very much more of the purple tip of the males than those of the wet phase. In the wet phase, the purple colour is often entirely absent or represented by a mere trace.

TERACOLUS ANNÆ Wallengr.

I captured occasional individuals of this species over the whole area under discussion, but found it nowhere common. It is most common in dry and rather barren localities.

TERACOLUS OMPHALE Godt.

A common and universally distributed species throughout the year.

TERACOLUS ACHINE Cram.

A ubiquitous species, especially abundant in the dry season.

TERACOLUS EVENINA Wallengr.

A widely distributed insect, fairly common throughout the year. By no means so abundant as the two preceding species.

TERACOLUS ANTIGONE Boisd.

A very abundant little species, particularly in open country.

TERACOLUS AUXO Lucas.

Represented only by two males from the Luangwa valley, iv. and viii.

TERACOLUS DUCISSA Dognin.

I took this handsome *Teracolus* chiefly in hot dry places. Strange to say I only met with females, of which four were taken in the Kambove district, iv.–viii., and five others in the neighbourhood of Lake Bangweolo, vii.

ERONIA CLEODORA Hübn.

I found this a rare insect. I captured one individual at Kambove, iv., and saw one or two others. A second specimen was taken in the neighbourhood of Lake Bangweolo, vi.

ERONIA LEDA Boisd.

A common insect in the Luangwa valley but rather uncommon in the high plateau and in Katanga. It flies usually near the ground and is very active on the wing.

ERONIA ARGIA Fabr.

This species occurs all over the country in patches of forest, particularly in the neighbourhood of streams. It flies very high with a rather sailing flight and is not easily captured in quantities.

ERONIA THALASSINA Boisd.

This species occurs in the same localities as the foregoing and has much the same habits, the males being much more in evidence than the females.

ERONIA BUQUETI Boisd.

This would seem to be a coast species, as I took it only in the neighbourhood of Tete on the lower Zambezi. It has more the habits of *E. leda* than of the two preceding species.

CATOPSILIA FLORELLA Fabr.

Always abundant. Occasionally seen in enormous numbers. I once saw several "patches" of this species, several square yards in extent, on damp sand in a tributary of the Luangwa river, xi. They seemed to be almost entirely males.

TERIAS SENEGALENSIS Boisd.

Ubiquitous, as also are the two succeeding species.

TERIAS DESJARDINSI Boisd.

TERIAS BRIGITTA Cram.

In Katanga this is rather scarcer than the last-named.

COLIAS ELECTO L.

Only taken in the Alala plateau, Broken Hill district, and then sparingly. An open country species.

Fam. PAPILIONIDÆ.

PAPILIO DARDANUS Brown.

This Swallow-tail occurs sparingly in patches of forest in the Lualaba valley in Katanga and in the valley of the Kalungwisi river in N.E. Rhodesia. These points would seem to be the south-east limit of its distribution. The only females observed belonged to the form *hippocoon* Fabr. The males have the curious habit of following regular routes in the forest-clearings, which they traverse over and over again at intervals of three or four minutes.

PAPILIO HESPERUS Westw.

I saw a few worn specimens of this fine species on the Lufupa and Lubudi rivers, x., and found it not uncommon in the valleys of the Kalungwisi and Lofu, viii. and ix. It is usually to be seen flitting round the outskirts of patches of dense forest.

PAPILIO CONSTANTINUS Ward.

A widely distributed species. Generally taken near the ground among grasses, rocks, etc., on wooded hillsides.

PAPILIO MACKINNONI BENGUELLÆ.

Papilio mackinnoni benguellæ Rothsch. & Jord. Nov. Zool. xv. p. 253.

This is a scarce insect frequenting dense forest. I met with it on the upper Kafue river, x., and at Kambove, ii. It is wary and a strong flier.

PAPILIO PHORCAS Cram.

Not uncommon in the Lualaba valley, iv. and v. Not observed elsewhere.

PAPILIO NIREUS L.

A widely distributed insect but not often abundant anywhere. It chiefly frequents low-lying river-valleys and I did not meet with it in high plateau country.

PAPILIO DEMODOCUS Esper.

Ubiquitous. Flies lower than most of the larger Papilios.

PAPILIO PYLADES ANGOLANUS Goeze.

This species is ubiquitous, and on the wing at all seasons. It usually frequents somewhat open country, and may be taken in numbers at damp mud.

PAPILIO TABORANUS Oberth.

I met with this species only on the upper Chambezi, iv. and x., and on the Lofu river, viii. It resembles the preceding species in its habits.

PAPILIO LATREILLANUS THEORINI Auriv.

I captured two specimens of this handsome *Papilio* in some dense forest, in October 1907, when on the Lufupa river, one of the western tributaries of the Lualaba. The specimens have, however, unfortunately been mislaid.

PAPILIO ALMANSOR Honrath.

I took one individual of this rare species on the upper Kafue river, xi., and three others in the Lualaba valley, iv. I subsequently found it not uncommon on the lower Chambezi river, x. It frequents open grassy spots.

PAPILIO LEONIDAS Fabr.

Ubiquitous. With regard to the flight of this insect Marshall* has told us that south of the Zambezi it does not perform the sailing evolutions of a Danaine, and says that it would be most interesting to know whether it has assumed this flight in Central Africa. This is certainly the case; and this insect is peculiarly fond of sailing slowly backwards and forwards over a distance of some 8–10 yards. As it usually does this about 10–12 feet from the ground, it is extremely difficult from below to recognize it as a *Papilio* at all. When startled or feeding on flower-heads it behaves differently and is distinctly active and restless.

PAPILIO ANTHEUS NYASSÆ Butler.

A common insect throughout the area under discussion. It is particularly abundant in the hot dry weather just before the beginning of the rains, and may then be seen in numbers at damp mud.

PAPILIO POLICENES Cram.

This insect occurs sparingly everywhere. It has much the same habits as the preceding species.

PAPILIO PORTHAON Hew.

I met with this insect only in the Luangwa valley and then sparingly.

Fam. HESPERIIDÆ.

TAGIADES FLESUS Fabr.

This is a common and universally distributed species with a very swift flight. As has often been recorded, it usually settles with wings outstretched on the lower side of leaves. It often does this so abruptly that it is not easy to see what has become of it.

EAGRIS JAMESONI Sharpe.

A common species at all seasons, the wet phase being much darker coloured than the dry one. Often in very large numbers in mud-holes.

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* Trans. Ent. Soc. 1902, p. 507.

EAGRIS LUCETIA Hew.

A single specimen of this rare species, taken at Kambove, iii. It is somewhat larger and darker coloured than the type and only specimen in the British Museum.

SARANGESA ASTRIGERA Butler.

A common woodland species in N.E. Rhodesia, both in the Luangwa valley and on the plateau. Individuals of the dry phase seem to lose all their spots on the upper surface though retaining them on the lower.

SARANGESA PLISTONICUS Plötz.

A fairly common species in the Luangwa and Chambezi valleys and the district of Bangweolo, iv.–viii. This species, as well as its allies, has a predilection for very shady spots, as has already been pointed out by Marshall * in the case of *S. eliminata* Holl. Jumping on the ground above a hole made by an Ant-bear will often cause clouds of them to issue forth.

SARANGESA SYNESTALMENUS Karsch.

This species, of which the preceding is perhaps the dry phase, is not uncommon in the Luangwa and Chambezi valleys, i.–v.

SARANGESA ELIMINATA Holl.

Only met with in the valleys of the Zambezi and Luangwa, vi.–xii.

SARANGESA PERTUSA Mab.

This species, which seems doubtfully distinct from the preceding, occurs sparingly in Katanga at Kambove, and on the Lualaba river.

SARANGESA MOTOZI Wallengr.

A very common species in the Luangwa and Chambezi valleys. *S. ophthalmica* Mab. appears to be referable to the female of this species.

SARANGESA MOTOZIOIDES Holl.

Occurs sparingly in the Luangwa valley, xi.–v., and has much the same habits as *motozi.*

SARANGESA SUBALBICANS.

Sarangesa subalbicans Beth.-Baker, Ann. N. H. (7) xvii. p. 342 (1906).

A single individual of this recently described species was captured at Kambove, iv.

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* Trans. Ent. Soc. 1902, p. 422.

SARANGESA MAXIMA, sp. n. (Plate III. fig. 11, ♂.)

A very large species, characterised by its broad wings and orange underside.

♂. UPPERSIDE. Ground-colour pale olive-grey, through which the orange underside faintly shows, with dark markings and small hyaline spots.

Primaries. A narrow dark median fascia from costa to hind margin crossing cell just before end and forming in area 2 a rather large dark spot; before middle a narrow dark line in area 1 *b* connecting veins 1 and 2; a small hyaline discocellular spot (indistinct on upper surface); a broad short dark fascia beyond cell-end from costa to vein 6, bounded outwardly by two hyaline spots (the second and posterior very indistinct); hyaline spots below cell-end in areas 3 and 2, of which the latter is the larger; a faint submarginal row of dark internervular spots; a linear dark margin.

Secondaries. Dark spots above, within and below cell-middle; a large discocellular; a discal row of dark internervular spots around cell-end, a similar but less distinct submarginal row.

UNDERSIDE.—*Primaries.* All the markings more distinct, the ground-colour, except on hind margin, replaced by bright orange.

Secondaries. Markings as upperside but whole wing, except a patch on anterior part of outer margin, suffused with bright orange.

Fringe long and same shade as upperside ground-colour; *palpi* dusky brown above, pale yellow below; *thorax* and *abdomen* above, as upperside ground-colour, below, pale yellowish.

Length of primary 19 mm.

This species, with its broad rounded wings, resembles in shape *djælælæ* Wallengr., and its allies, but in its only slightly waved outline and general distribution of markings is more like *motozi*, etc.

Type ♂ in British Museum: Lualaba river, 29.v.07.

Cotype in Hope Coll., Oxford: upper Kalungwisi valley, 7.ix.08.

This is a forest species, of which the above two specimens were the only ones met with.

SARANGESA DJÆLÆLÆ Wallengr.

Pterygospidia djælælæ Wallengr. K.S. Vet.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 54, no. 5.

This species is not uncommon and is widely distributed. Some individuals, more especially those from the more northern part of the high plateau country, are larger than S. African specimens, rather paler above, and less flushed with fulvous below.

SARANGESA NOX, sp. n. (Plate III. fig. 16, ♂.)

Allied to *S. djælælæ* Wallengr., but dull black and almost without a rufous underside.

♂. UPPERSIDE.—*Primaries* dull black with a slight appearance of iridescence toward margins, due to the presence of a few pale blue scales; three small hyaline spots below costa between cell-end and apex; a minute hyaline spot in area 3 below cell-end, and below it in area 2 a narrow hyaline streak.

Secondaries. Ground-colour as primaries, immaculate.

UNDERSIDE as upperside but paler; in primaries a well-marked rufous streak passes through cell-end; in some individuals a faint trace of same in secondaries.

Palpi ochreous tipped dusky; *thorax*, *abdomen*, and *fringe* dusky.

Type ♂ in Hope Coll., Oxford: Petauke, Luangwa valley, 16.ii.05. Also two, Luangwa valley, ii. and vi.

SARANGESA PERPAUPERA Holl.

Not rare in high plateau country of Northern Rhodesia and in Katanga.

SARANGESA HOLLANDI Butler.

This species, which seems exceedingly rare in collections and very doubtfully referable to this genus, was by no means rare in the valleys of the Lofu and Kalungwisi rivers, vii.–ix. It frequents the outskirts of patches of dense forest.

CELÆNORRHINUS INTERMIXTUS.

Celænorrhinus intermixtus Auriv. Ent. Tidskr. xvii. p. 280 (1896).

Celænorrhinus opalinus Butler.

Two individuals captured in forest on the high plateau south of Lake Tanganyika, viii.

CELÆNORRHINUS GALENUS Fabr.

A ubiquitous forest species.

ABANTIS VENOSA Trim.

A common species everywhere. Extreme dry specimens are of a golden-brown colour, losing all the white discal area and black margin of the hind wing underside.

A. plerotica Karsch * appears to represent an extreme wet phase of this species.

ABANTIS ZAMBESIACA Westw.

This species is ubiquitous and on the wing at all seasons. It may often be taken in large numbers at damp mud.

ABANTIS PARADISEA Butler.

A common species in the wet season in the Luangwa valley but rare on the plateau. It has much the same habits as the preceding.

* Ent. Nachr. xxii. p. 374 (1896).

Abantis lofu, sp. n. (Plate III. figs. 4, 5, ♂, ♀.)

Somewhat allied to *A. venosa* Trim. and *bismarcki* Karsch, but the greater portion of the secondaries white on the *upper* surface.

♂. Upperside.—*Primaries.* The basal three-fifths heavily scaled with orange ochraceous, the remainder of wing brown, the veins dusky, the following spots hyaline:—below costa between end of cell and apex three small spots of which the middle one is the longest; below end of cell a group of three spots divided only by crossing veins, the first and smallest within cell, second in angle of median and vein 3, the third and largest betweeen 3 and 2.

Secondaries. The whole discal area white, the costal margin ochreous, the outer and inner margins black; outer margin encloses a row of small internervular spots; these, which are ochreous towards costal margin, increase in size toward anal angle, and there are represented by three larger white spots; black margin slightly invades discal area in the veins and vein 1 *b* is wholly black.

Underside much as upperside but paler, on secondaries outer margin except at anal angle is pale greyish-brown, not black, and marginal spots are evanescent; vein 1 *b* is white, and the black of inner margin is covered with many whitish scales.

Fringe dusky, white on anal angle and inner margin of secondaries; *thorax* above orange-ochreous, marked posteriorly with two pairs of white spots; *abdomen* white, with a mid-dorsal black streak and two narrow black ventral lines, tipped with a brush of ochreous hairs; anterior legs covered with ochreous, remainder with white hairs.

Length of primary 19 mm.

Type ♂ and only specimen in Hope Coll., Oxford. Taken in a patch of dense forest on the plateau between the Lofu river and Lake Tanganyika, 24.viii.08.

The female of this species seems to be represented by a specimen captured on the edge of a very similar patch of forest east of Lake Bangweolo. It differs considerably from the male, especially in the primaries. These are more rounded than in the male, and the basal portion is a brighter orange colour, the distal portion being dusky, the two colours not blending into one another as in the male. There is an increase in number and size of the hyaline markings; between cell-end and apex four larger hyaline spots of nearly equal size; spots below cell-end enormously enlarged, especially that in area 2; an additional hyaline streak below this last in 1 *b*.

Secondaries as in male, but broader and more rounded.

Underside as described in male, but outer margin of secondaries is darker and encloses small white marginal spot as on upperside. Colour of abdomen etc. as in male, but sides of thorax appear to bear white not ochreous hairs.

♀ type also in Hope Coll., Oxford: east of Lake Bangweolo, 11.ix.08.

This female specimen exhibits a close relationship to *A. arcto-*

marginata Lathy, the next species. It chiefly differs from that species in the colour and markings of the base of the primaries on the upperside, and in having a yellow, not black, costal margin to the secondaries on the underside.

ABANTIS ARCTOMARGINATA.

Abantis arctomarginata Lathy, Trans. Ent. Soc. 1901, p. 34, pl. iii. fig. 7.

One female from Kambove, ii.

The secondaries have a wider black hind margin than that figured in the type.

ABANTIS LEVUBU Wallengr.

I took this species only in the Luangwa valley, ii., iii., where it was scarce.

CAPRONA PILLAANA Wallengr.

Occurs sparingly throughout Northern Rhodesia.

CARCHARODUS ELMA Trim.

Not uncommon in the lower Luangwa valley; rare on the plateau and in Katanga.

HESPERIA PLOETZI Auriv.

A single individual from the Lufupa river, x.

HESPERIA SECESSUS Trim.

A species not uncommon on the plateau, especially in the Lake Bangweolo district.

All these African species of *Hesperia* have similar habits. They live amongst grasses and plants, near the ground, in open or woodland localities.

HESPERIA ZEBRA.

Hesperia zebra Butler, Ann. N. H. (6) i. p. 207 (1888).

A few individuals from Fort Jameson and the Luangwa valley, ii.–iv.

They are considerably larger than Mashonaland specimens in the National Collection, which are in their turn larger than the type from India.

HESPERIA DIOMUS Hopff.

A single specimen from the high plateau between the Lofu river and Lake Tanganyika, viii., and another near the mouth of the Chambezi river, x.

HESPERIA DROMUS Plötz.

The commonest species of the genus; occurring everywhere and at all seasons.

HESPERIA VINDEX Cram.

A common and ubiquitous species.

HESPERIA MAFA Trim.

Sparingly met with in the Luangwa valley and on the Broken Hill plateau to the west of it.

HESPERIA BETTONI.

Hesperia bettoni Butler, P. Z. S. 1898, p. 415, pl. xxxii. fig. 1.

The collection comprises a series which I refer with some doubt to the above species. They may perhaps prove to be the wet-season form of it. I met with the species only in the Luangwa valley, ii., iii.

OXYPALPUS WOLLASTONI.

Oxypalpus wollastoni Heron, Trans. Z. S. vol. xix. p. 171.

Occurs rarely in forest country on the Lualaba in Katanga, and on the Kalungwisi river in N.E. Rhodesia.

OXYPALPUS RUTILANS Mab.

A single individual from dense forest on the Kalungwisi river, x.

OXYPALPUS FULVUS.

Oxypalpus fulvus Lathy, Trans. Ent. Soc. 1903, pp. 203, 204, pl. viii. fig. 11.

A single specimen of this brilliant little species from the Lufupa river, xi.

PAROSMODES HARONA Westw.

Pamphila harona Westw., Oates' Matabeleland, p. 253 (1881).
Oxypalpus ruso Mab.
Pamphila ruso Mab. C. R. Soc. Ent. Belg. vol. xxv. p. clxxxiii. (1891).
Oxypalpus ruso Holl. P. Z. S. 1896, p. 130, pl. iii. fig. 13.

From my field experience I am strongly inclined to think that *ruso* Mab. represents the wet phase of *harona* Westw. Both forms are essentially woodland species. In the main *ruso* is confined to the wet season, but on the high plateau, where the climate is much colder, it may be taken during the first two or three months of the dry season. Both forms are extremely common in their season.

PAROSMODES ICTERIA Mab.

This is a woodland species which is extremely abundant everywhere.

PAROSMODES MORANTII Trim.

I found this species, though widely distributed, to be everywhere uncommon. The collection includes a very large and brightly coloured female from Mirongo, on the edge of the escarpment, upper Luangwa valley, iv.

PAROSMODES NUMA.

Parosmodes numa Druce, Ann. N. H. vii. p. 432 (1901).

Of this species, which seems to be extremely rare in collections, I captured a few individuals in the lower ground in the Luangwa valley. I found it nowhere common, but it seems to be on the wing all the year.

ACLEROS MACKENII Trim.

I refer my specimens with some doubt to this species, as the males do not lack the white spots on the primaries as in South African specimens. This species sometimes occurs in countless thousands in patches of dense forest, which it never seems to leave. It seldom appears to fly far from the ground.

ANDRONYMUS FENESTRELLA.

Andronymus fenestrella Beth.-Baker, Ann. N. H. (8) ii. p. 481 (1908).

This species occurs sparingly in dense forest in Katanga and in the valley of the Kalungwisi river in N.E. Rhodesia. The males are somewhat larger than the type, but do not otherwise differ. The females are characterised by a greater extension of the ochreous discal area of the secondaries which, between veins 2 and 7 and at the anal angle, nearly reaches the hind margin. On the underside this is especially marked. The hyaline markings on the secondaries characteristic of the male are also absent.

ANDRONYMUS PHILANDER Hopff.

A common forest species.

ACROMESIS NEANDER Plötz.

Inhabits the same localities and occurs side by side with the preceding.

GORGYRA JOHNSTONI Butler.

This little species is common on the high plateau, but appears to be absent from the Luangwa valley.

GORGYRA ABURÆ Plötz.

Two specimens from dense forest, on the Kalungwisi river, ix.

HYPOLEUCIS OPHIUSA Wallengr.

A single specimen from dense forest, on the Kalungwisi river, ix.

CYCLOPIDES WILLEMI Wallengr.

I did not find this a common species. I captured a single specimen in the Fort Jameson district, iv.1904, and subsequently a small series in the Lualaba valley, iv.1907.

CYCLOPIDES COOKSONI.

Cyclopides cooksoni H. H. Druce, Trans. Ent. Soc. 1905, p. 260, pl. xiii. fig. 10.

I took four specimens of this striking species at Kambove, iii.

CYCLOPIDES FORMOSUS Butler.

I found this species abundant in Katanga in the wet season but much less common in Northern Rhodesia.

CYCLOPIDES MIDAS Butler.

Abundant everywhere except in the Luangwa valley.

CYCLOPIDES KAMBOVE, sp. n. (Plate III. fig. 14, ♂.)

Dusky, with large orange spots on primary. Allied to *quadrisignatus* Butl., but with the spots much larger and more numerous.

♂. UPPERSIDE.—*Primaries* dusky, the basal third bearing a few scattered golden scales; the following golden-orange spots:—a large rectangular discocellular spot, a smaller one above it below costa, two subapical spots, that nearer costa the larger; an irregular spot the largest of all, lies below and a little beyond cell-end between veins 4 and 2; a small spot below it in 1 *b*, sometimes confluent with last. *Secondaries* dusky, without spots, with scattered golden hairs at base, and in some specimens with a few golden scales on discal area.

UNDERSIDE as upperside, but spots of primary larger and somewhat confluent.

Fringe dusky; *palpi* golden tipped dusky; *thorax* and *abdomen* dusky, sides of latter with a few golden scales.

Length of primary 14–16 mm.

Type ♂ in British Museum: Kambove, 24.vi.07. Cotypes in Hope Coll., Oxford.

Described from six individuals from same locality, all except type taken in March.

CYCLOPIDES WALLACEI, sp. n. (Plate III. fig. 15, ♂.)

Dusky with cream-coloured markings; allied to *C. willemi* Wall., in coloration, but in distribution of markings near *C. punctulata* Butler.

♂. UPPERSIDE.—*Primaries* dusky; a minute discocellular whitish spot; below costa between cell and apex three elongated cream-coloured spots, of which the middle one is the smallest and placed more proximally than the others; a submarginal row of six internervular spots of the same colour, two of which are in area 1 *b*, the upper the smaller of the two.

Secondaries uniformly dusky with traces of five creamy spots of discal row, which is best described from underside.

UNDERSIDE.—*Primary* as upperside with addition of pale ochreous triangular streaks at all the vein-endings.

Secondary. The whole neuration outlined in pale ochreous, intensified towards margin; a discal row from costa of eight internervular cream-coloured spots, small and paired in area 1 *b.*

Fringe cream-coloured; *palpi* creamy white with some scattered black hairs; *thorax* dusky; *abdomen* dusky above, with a lateral and paired ventral creamy white lines, edges of segments being outlined in the same colour.

Length of primary 16·5 mm.

Type ♂ in the British Museum: Kansanshi, N.W. Rhodesia, 16.i.07.

The only specimen met with of this very distinct species. I have much pleasure in dedicating it to my friend Mr. L. A. Wallace, Administrator of N.W. Rhodesia.

CYCLOPIDES PUNCTULATA Butler.

I took this species sparingly at Kambove, iii., and on the high plateau near Serenji, N.E. Rhodesia, xii.

CYCLOPIDES STELLATA Mab.

I met with this species commonly on wooded hillsides at Petauke, Luangwa valley, xii.–iii., but not elsewhere.

HETEROPTERUS ABJECTA Snell.

Baracus furvus Mab.

Three specimens from the Lubudi and Lufupa rivers, x. and xi.

KEDESTES CAPENAS Hew.

Common in the Luangwa valley, ii.–iv. Also taken sparingly at Kambove, iii.

KEDESTES LEMA, sp. n. (Plate III. fig. 8, ♂.)

A dusky species with a very distinct underside; not apparently nearly allied to any species I can find described.

♂. UPPERSIDE.—*Primaries* dusky, marked with the following whitish spots:—a discocellular; three spots beyond cell near costa, of which the upper one is very small; two somewhat rectangular discal spots in areas 4 and 5, followed by two more proximally placed spots in areas 2 and 1 *b*, the latter paired, the upper portion much the smaller.

Secondaries uniformly dusky.

UNDERSIDE.—*Primaries.* Spots as upperside, costa and ends of veins on outer margin outlined in yellowish.

Secondaries. Costa narrowly, inner margin broadly, blackish. Basal area of wing to beyond cell-end pale yellowish, enclosing the following black spots and streaks:—a spot above cell, a broad streak within cell, and another streak below cell in area 1*c*; a row of six discal spots from costa around cell and to vein 2; the first of these, that below costa, extends to outer margin as a long black streak; outer margin broad, consisting of black internervular streaks, alternating with the veins which are outlined in pale yellowish; broad, black inner margin bears two faint rows of golden scales.

Fringe dusky; *palpi* very short, with a few dark hairs at tip; *thorax* dusky; *abdomen* dusky above, *ochreous* below.

Length of primary 12·5 mm.

Type ♂ in the British Museum: Kambove, Katanga, 8.ii.07.

Described from a single male, which is a rather worn specimen. It is possible that in a fresh specimen the yellow coloration on the underside would be much brighter.

From so little material I should have hesitated to describe this species but for its very distinct underside.

KEDESTES CHACA Trim.

A single male from the Lualaba river, iv.

KEDESTES TUCUSA Trim.

Represented by two males from Mporokoso, upper Kalungwisi valley, viii. and ix. These specimens are rather smaller and more clearly marked than South African specimens.

KEDESTES MOHOZUTZA Wallengr.

A common species on the high plateau during the wet season. Not met with in the Luangwa valley or in Katanga.

KEDESTES FENESTRATUS Butler.

I have in the collection a considerable series of a species very doubtfully distinct from the above. Most individuals have a distinct discal row of pale spots around cell on underside of secondaries, but there are traces of these in the types from Zomba.

KEDESTES CALLICLES Hew.

A common Luangwa valley species, xii.–iv.

KEDESTES MALUA, sp. n. (Plate III. fig. 12, ♂.)

A very distinct species, perhaps remotely allied to *mohozutza* etc., the olive-yellow white-spotted underside being especially characteristic.

♂. UPPERSIDE.—*Primaries* dusky olive, with a few yellowish scales at base especially along costal and inner margins; the following hyaline spots:—a discocellular; three minute spots below costa midway between cell-end and apex; a small spot in area 3 *beyond* and a much larger one in area 2 *below* end of cell; traces of a yellowish spot on middle of vein 1; a line of indefinite yellowish submarginal internervular spots following outer margin.

Secondaries somewhat darker than primaries, the base (especially towards inner margin) more or less covered with olive-yellow hairs; a submarginal patch of yellow scales above and below vein 5.

UNDERSIDE.—*Primaries.* Hyaline spots as upperside, but ground-colour, especially on costa, apex, and outer margin heavily scaled with ochreous; a faint submarginal dark line and a narrow outer marginal line of creamy-white crossed by the dark veins.

Secondaries. Ground-colour along inner margin in areas 1 *a*, 1 *b* as upperside, remainder ochreous-brown, somewhat darker on costal and anterior part of outer margins; the following creamy-white spots outlined in black:—one above and one below cell-middle (the latter darker and indistinct); an elongate discocellular spot; a discal row of seven spots crossed by dark veins, extending from costa around cell-end to vein 2, ending in a separated eighth spot in area 1 *c*; the same white marginal line as in primary.

Fringe pale brown, inclining to whitish on anal angle; *palpi* whitish, tipped dusky; *thorax* above covered with ochreous-yellow hairs; *abdomen* dusky, with some hairs of same colour especially at tip.

Length of primary 13·5 mm.

The female of this species is a little larger (length of primary 15 mm.), and has the yellow submarginal row on upperside better developed.

Type ♂ in the British Museum, from the Chambezi valley, 8.v.08.

Type ♀ in Hope Coll., Oxford: Chambezi valley, 15.v.08.

Described from four males and two females.

This striking species seems to be confined to high plateau country, and is distinctly scarce.

PADRAONA ZENO Trim.

A common forest species in the plateau and in Katanga. I did not meet with it in the Luangwa valley.

GEGENES OCCULTA Trim.

I took this species sparingly in the Fort Jameson district and Luangwa valley, iii., iv., and on the Alala plateau, ix.

GEGENES HOTTENTOTA Latr.

A common species everywhere, especially so in the Chambezi valley. The form *obumbrata* Trim., occurs side by side with it, and three or four individuals are intermediate between the two, having the bright ochreous colour of that form but lacking the sexual badges. It seems impossible to separate the females in a large series, and until more evidence is forthcoming it seems wiser to keep the two forms together.

CHAPRA MATHIAS Fabr.

Ubiquitous and on the wing all the year.

PARNARA FATUELLUS Hopff.

A common species everywhere.

PARNARA BORBONICA Boisd.

Less common than the preceding species, rather scarce in the Luangwa valley.

PARNARA DETECTA Trim.

Ubiquitous.

PARNARA AURITINCTUS Butler.

Baoris auritinctus Butler, P. Z. S. 1898, p. 416, pl. xxxii. fig. 2.

Of this species, which seems rare in collections, I took several specimens in the Chambezi valley, iv. and v.

PARNARA MICANS Holl.

Parnara micans Holl. P. Z. S. 1896, p. 63, pl. iii. fig. 19.

I found this species sparingly in Katanga, but subsequently took it abundantly on the Chambezi river, iv., v., and less commonly on the Kalungwisi, ix.

PARNARA CHAMBEZI, sp. n. (Plate III. fig. 9, ♂.)

Somewhat allied to *micans* Holl., but a smaller insect without any rufous-orange colour on upper surface, and with all the hyaline spots larger and better developed, especially on secondaries.

♂. UPPERSIDE.—*Primaries* olive-brownish, with a few ochreous scales at base and on inner margin; the following hyaline spots: one within cell near and below costa; three below costa between cell and apex (the first of these often much reduced or absent in the male); three discal spots below cell and in areas 4, 3, 2, the last the largest.

Secondaries. Ground-colour as primaries; a clearly-marked row of four whitish spots below and beyond cell-end in areas 5, 4, 3, 2.

UNDERSIDE.—Costa, apical portion of primaries, and whole of secondaries except inner margin and areas 1 *a*, 1 *b*, flushed with bright ferruginous spots as upperside, but discal spots accompanied exteriorly by small patches of upperside ground-colour. Sometimes a small whitish discocellular spot in secondaries and an additional spot of discal row in area 6.

Palpi pale ochreous; *thorax* and *abdomen* as ground-colour; tip of *abdomen* ferruginous below.

Length of primary 14 mm.

The females are larger, primary 15·5 mm., and have all the spots markedly larger.

Types ♂ and ♀ in the British Museum: Chambezi valley, 15 & 18.iv.08.

Cotypes in Hope Coll., Oxford, from the same locality.

Described from 37 males and 18 females.

This species was common in the Chambezi valley, iv., but was not met with elsewhere.

PARNARA SUBOCHRACEA.

Parnara subochracea Holl. P. Z. S. 1896, p. 63, pl. iv. fig. 2.

I have a series from the Chambezi valley which I do not care to pronounce distinct from the above species. They are, however, altogether paler and have an additional spot on the primary, viz. on vein 1, sometimes also a spot in the upper part of the cell near its end.

PARNARA ARELA Mab.

Baoris arela Holl. P. Z. S. 1896, p. 68, pl. ii. fig. 20.

A few individuals from the Chambezi and Kalungwisi valleys, iv. ix.

PARNARA LAREA, sp. n. (Plate III. fig. 13, ♂.)

In its broad rounded wings and in general distribution of its spots this species is allied to *arela* Mab. It is, however, a much darker species, differing very much on the underside, and has a broad pale fringe compared with a narrow dark one in *arela*.

♂. UPPERSIDE dark brown with a faint purplish flush toward base.

Primaries. The spots as in *arela*, the three small spots forming a row below costa are in a straight line, the middle one *not* being more proximal than the others as it is in *arela*.

Secondaries. Ground-colour as in primaries; two indistinct spots below cell and in areas 3 and 2, always present.

UNDERSIDE.—Spots as upperside; apex of primaries and whole of secondaries flushed with purple overlaid with scattered bluish scales.

Fringe very long, varying from whitish to pale ochreous; *palpi* pale ochreous; *thorax* and *abdomen* coloured as upperside, paler below.

Length of primary 17 mm.

The females are rather darker, larger, and have more rounded wings.

Type ♂ in the British Museum: east shore of Lake Bangweolo, 22.v.08.

Type ♀ in the British Museum: Kambove, Katanga, 20.iii.07.

Cotypes in the Hope Coll., Oxford: four males from Lake Bangweolo and the Chambezi valley, iv.–vii., one female from the Lualaba river, Katanga, iv.

PARNARA ILIAS Plötz, Stett. Ent. Zeit. xl. p. 355.

Baoris ilias Holl. P. Z. S. 1896, p. 67, pl. v. fig. 17.

I took one individual of this species on the Lualaba river, iv., and subsequently a few others in the Lake Bangweolo district and the Kalungwisi valley, vii.–ix.

PARNARA ENTEBBEA Swinh.

Parnara entebbea Swinh. Ann. N. H. (8) iii. p. 90 (1909).

I assign my specimens with some doubt to the above species;

they have the same obsolete bands of spots on the underside of the secondaries, but are much larger and lighter coloured. The only female has a chequered fringe to the primary, this agreeing with a female in the National Collection which is perhaps that of *entebbea*.

This species was taken at Kambove, iii., vii., Lualaba valley, v., xi., Kalungwisi valley, ix.

PARNARA SAXICOLA, sp. n. (Plate III. fig. 10, ♂.)

A rather large, broad-winged species of a greyish colour, without apparently any very near allies.

♂. UPPERSIDE.—*Primaries* dull greyish brown with the following whitish spots:—two within cell a little before end; a discal row of six spots from costa to vein 2, arranged on two sides of a triangle; the spot in area 5 which is evanescent forms the apex and is nearest the outer margin; the last spot, that in area 2, being the largest of the row.

Secondaries unicolorous, the same colour as primaries.

UNDERSIDE.—*Primaries.* Spotting as upperside but rather more distinct, an additional spot in discal row in area 1 *b*. Costal margin and apex of primaries and whole of *secondaries* heavily scaled with grey; in secondaries scales enclose two obscure rows of spots, one across cell and the other around cell-end. A narrow dusky marginal line to both wings.

Fringe brownish on primaries, grey on secondaries; *palpi* grey tipped dusky; *thorax* and *abdomen* above brownish; *abdomen* below dirty white; *legs* grey.

Length of primary 19 mm.

Type ♂ in British Museum, from near the Lualaba river, 22.iv.07.

Cotype ♂ in Hope Coll., Oxford: New Kalungwisi Station, 20.x.08.

'I met with this peculiar species, of which I can find no near allies, only in these two localities. It was found frequenting the neighbourhood of some large rocks in the midst of woodland. It was not rare on this spot, but exceedingly wary. I never saw it settle elsewhere than on these rocks, where its peculiarly cryptic underside made it very difficult to see. So difficult was it to capture that the above described specimen represents the sole result of an hour's work. The second specimen was captured by a native collector on ground of a similar character.

PARNARA (SEMALEA) PULVINA Plötz.

This species is a forest one. It occurred on the Lualaba river, iv., v.; Lake Bangweolo, vii.; Lofu river, viii.; Kalungwisi district, x.

PARNARA (SEMALEA) NOX Mab.

Two specimens from the Lualaba river, iv. and v., and several from the high country of the Kalungwisi district, ix.

BAORIS NYASSÆ Hew.

A common species in the high plateau country. It appears to me to be a distinct species from *netopha* Hew. It hangs from grasses etc., with wings closed above its back when at rest, looking quite like a small *Acræa*.

BAORIS NETOPHA Hew.

I found this species, with which the foregoing has been sometimes confused, to be distinctly rare. I met with it only in forest in the Kalungwisi valley, ix.

BAORIS NIVEICORNIS Plötz.

A by no means uncommon high plateau species. It is very active on the wing and good specimens are very difficult to obtain, as it is extraordinarily violent when in the net.

PLATYLESCHES AYRESI Trim.

A common high plateau species but rare on the low ground.

PLATYLESCHES NIGRICANS Holl.

A scarce species, taken only at Ndola, upper Kafue river, ix., and the Chambezi valley, iv.

PLATYLESCHES NIGERRIMA Butler.

Represented by a single specimen from the upper Lufupa river, xi.

PLATYLESCHES MORITILI Wallengr.

This species is ubiquitous.

PLATYLESCHES ROBUSTUS, sp. n. (Plate III. fig. 7, ♂.)

Resembles *P. moritili* Wallengr., on the upperside, and *P. neba* Hew.*, on the underside, but is a much larger species than either.

♂. UPPERSIDE much as in *moritili*, but in the *primaries*, of the two spots in cell near its end, the upper one is small and often absent; hyaline spots as in *moritili*; yellowish spot on middle of vein, if present, is very faint; a bright yellow streak along proximal two-thirds of inner margin.

Secondaries. Yellowish hairs at base, on inner margin and on discal band below cell-end, more developed and of a brighter yellow than in *moritili*.

UNDERSIDE.—Much paler than *moritili*; on *primaries* a well developed pale yellow streak between 1 and 2; apex and anterior part of outer margin flushed with pale blue.

Secondaries. Anterior part of outer margin broadly, inner margin narrowly, flushed with pale blue; at anal angle a large patch of brownish chocolate extending up area 1 *b* for nearly half its length; this patch sometimes edged with whitish towards margins.

Fringe dark brown, on secondaries much paler, becoming whitish toward anal angle; *palpi* dusky above, white below; *thorax* above and base of *abdomen* covered with greenish-yellow hairs.

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* *Hesperia neba* Hew., Ann. N. H. (4) xix. p. 84.

Average length of primary 17 mm.

P. robustus with its large size, stout thorax and elongate wings, differs from both *moritili* and *neba*, which seem to be its nearest allies, though perhaps, with its striking underside, it is more closely related to the latter.

Type ♂ in the British Museum, from the Chambezi valley, 7.v.08.

Type ♀ in the British Museum, from the high plateau, south of Lake Tanganyika, 22.viii.08.

Cotypes in the Hope Coll., Oxford.

Described from 55 individuals.

I found this large *Platylesches* to be a common one, especially in high plateau country. It usually frequents grasses, etc., in or on the outskirts of woodland. It has also been taken sparingly in Mashonaland by Mr. G. A. K. Marshall.

PLATYLESCHES PICANINI.

Platylesches picanini Holl. Ent. News, v. p. 91, pl. iii. fig. 9 (1894).

Represented by two individuals from the Alala plateau north-east of Broken Hill, and by two others from east of Lake Bangweolo, x. They both differ somewhat from typical specimens in having the yellow band across the secondaries considerably broader.

PLATYLESCHES LAMBA, sp. n. (Plate III. fig. 6, ♂.)

Allied to *picanini* Holl., but a slightly larger insect, the band across the underside of secondaries being broader, pure white, and not interrupted toward inner margin as in that species.

♂. UPPERSIDE.—*Primaries* dusky with a greenish iridescence, with the following hyaline markings:—two streaks in cell near its end, the lower much the larger; three small discal spots in areas 7, 4, 3, the last the most proximally placed; a large irregular spot in area 2 below cell-end; a creamy-white spot on vein 1 a little before middle.

Secondaries. Ground-colour as primaries; a row of three golden spots (the first very small) below cell-end in areas 4, 3, 2, followed by a larger, more indefinite dull yellow spot in area 1 *c*.

UNDERSIDE.—*Primaries*. Ground-colour as upperside but lacking iridescence; a narrow line of yellow on costa near base and a well-marked long white streak about middle in area 1 *b*.

Secondaries. A broad creamy-white discal band from costa to inner margin. No break in areas 1 *b*, 1 *c* as in *picanini*.

Fringe dusky, paler towards anal angle; *palpi* creamy white; *thorax* and base of *abdomen* above covered with iridescent greenish hairs.

Length of primary 16 mm.

Type ♂ in Hope Coll., Oxford: lower Chambezi valley, 17.x.08.

Cotype ♂ in British Museum: Lufupa river, W. Katanga, 5.xi.07.

Type ♀ and cotype ♂ in Hope Coll., Oxford, from east shore of Lake Bangweolo, 23.v.08; 14.17.x.08.

Described from three males and one female.

PARDALEODES INCERTA Snell.

A forest species; taken on the Lualaba river, v., and Lofu and Kalungwisi rivers, viii., ix.

PARDALEODES VIBIUS Hew.

Represented by two specimens from the Lualaba river, v., and one from Kalungwisi, ix.

COENIDES sp. near DACELA Hew.

A single specimen in rather bad condition which appears to be distinct from *dacela* Hew., but which in the circumstances I hesitate to describe. Lufupa river, xi.

COENIDES LEONORA Plötz.

A single specimen of this handsome species from the Lufupa river, xi.

RHOPALOCAMPTA LIBEON Druce.

Rhopalocampta unicolor Mab.

I found this species not uncommon in the high plateau country in the Kalungwisi district, but did not meet with it elsewhere.

RHOPALOCAMPTA PISISTRATUS Fabr.

This species occurs over a wide area, but I never took any great numbers of it. It is perhaps often mistaken for the next species which is so abundant.

RHOPALOCAMPTA FORESTAN Cram.

Extremely common everywhere. This species is much attracted by moisture, and if one is sitting or standing still will often settle on one's hands and arms attracted by the perspiration.

EXPLANATION OF THE PLATES

PLATE I.

Fig. 1. *Amauris lobengula katangæ*, ♂, subsp. n.
2. *Acræa welwitschi* Rogenh., ♂.
3. „ *mirifica* Lathy, ♀.
4. „ *lualabæ* ♂, sp. n.
5. „ *nohara chambezi* ♂, subsp. n.
6. „ *detecta* ♂, sp. n.
6 *a*. „ „ ♂ genitalia (from an individual similar to the type).
6 *b*. „ *caldarena*, ♂ genitalia.
7. „ *lactea* ♀, sp. n.
8, 9. „ *mima* ♂ ♀, sp. n.

PLATE II.

Fig. 1. *Neptis jordani*, sp. n.
(For genitalia *vide* fig. in text p. 33.)
2. *Euptera elabontas mweruensis* ♂, subsp. n.
3. *Brenthis excelsior katangæ* ♂, subsp. n.
4. *Aphnæus questiauxi* Auriv., ♀.
5. *Lycænesthes gemmifera* ♂, sp. n.
6. *Pseudaletis mazanguli* ♀, sp. n.
7. *Spindasis trimeni* ♂, sp. n.
8. *Aphnæus marshalli* ♂, sp. n.
9, 10. *Catachrysops cupreus* ♂ ♀, sp. n.
11. *Deudorix kafuensis* ♂, sp. n.
12. „ *bemba* ♀, sp. n.

PLATE III.

Fig. 1. *Belenois picta*, dry ♂, sp. n.
2. „ „ wet ♂.
3. „ *crawshayi* f. *lata*, ♂, f. nov.
4, 5. *Abantis lofu* ♂ ♀, sp. n.
6. *Platylesches lamba* ♂, sp. n.
7. „ *robustus* ♂, sp. n.
8. *Kedestes lema* ♂, sp. n.
9. *Parnara chambezi* ♂, sp. n.
10. „ *saxicola* ♂, sp. n.
11. *Sarangesa maxima*, ♂, sp. n.
12. *Kedestes malua* ♂, sp. n.
13. *Parnara larea* ♂, sp. n.
14. *Cyclopides kambove* ♂, sp. n.
15. „ *wallacei* ♂, sp. n.
16. *Sarangesa nox* ♂, sp. n.

2. On the Marine Fishes and Invertebrates of St. Helena. By J. T. CUNNINGHAM, M.A., F.Z.S. With Description of new Species of Hydrozoa and Porifera, by R. KIRKPATRICK, F.Z.S.

(Plates IV.–VII.*, and Text-figures 3–6.)

[Received November 1, 1909.]

At the beginning of February this year Mr. Alfred Mosely, C.M.G., went with a small party of experts to the island of St. Helena in order to make some enquiries into the industries and resources of the island, with the object of developing as far as possible the means by which the population could support itself. Until recently the people have been to a great extent dependent on the market and the employment afforded by the garrison and various Government works in the island. In 1903 the Boer prisoners left the island, and not long afterwards the Imperial Government decided to withdraw the whole of the garrison. To prevent distress among the inhabitants the Government has taken steps to develop the manufacture of lace and of New Zealand flax, and Mr. Mosely's attention was directed to agriculture and fisheries. I was invited to accompany him in order to assist

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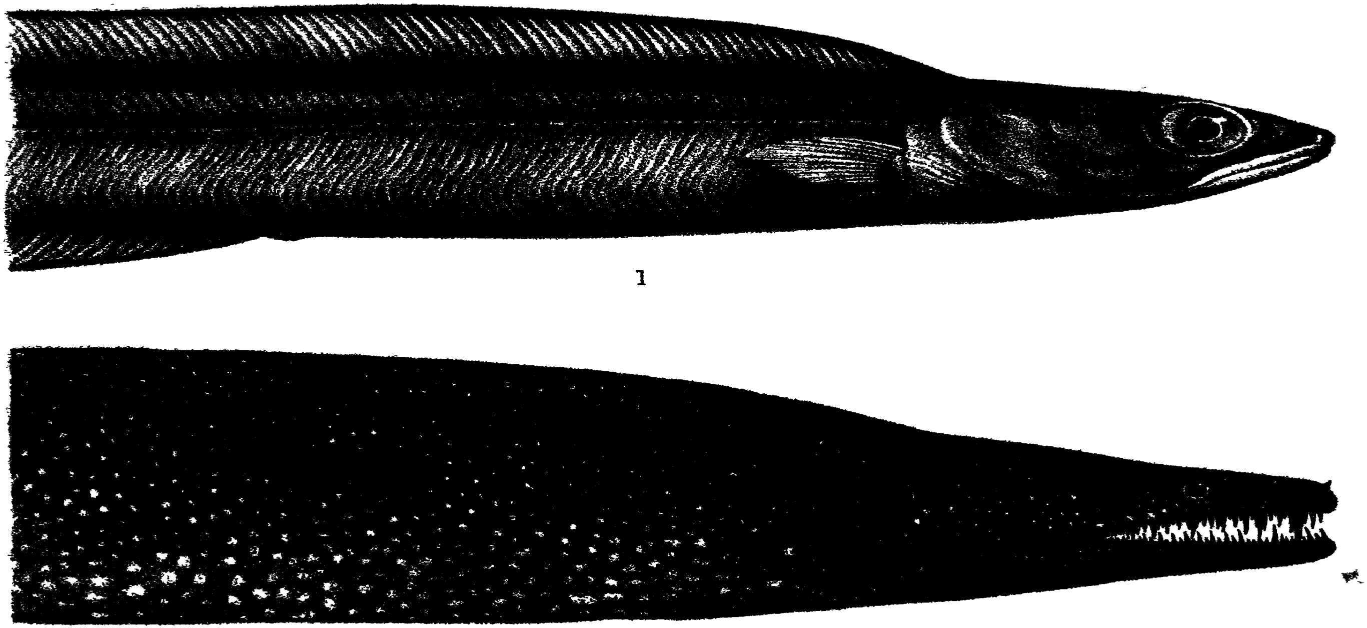
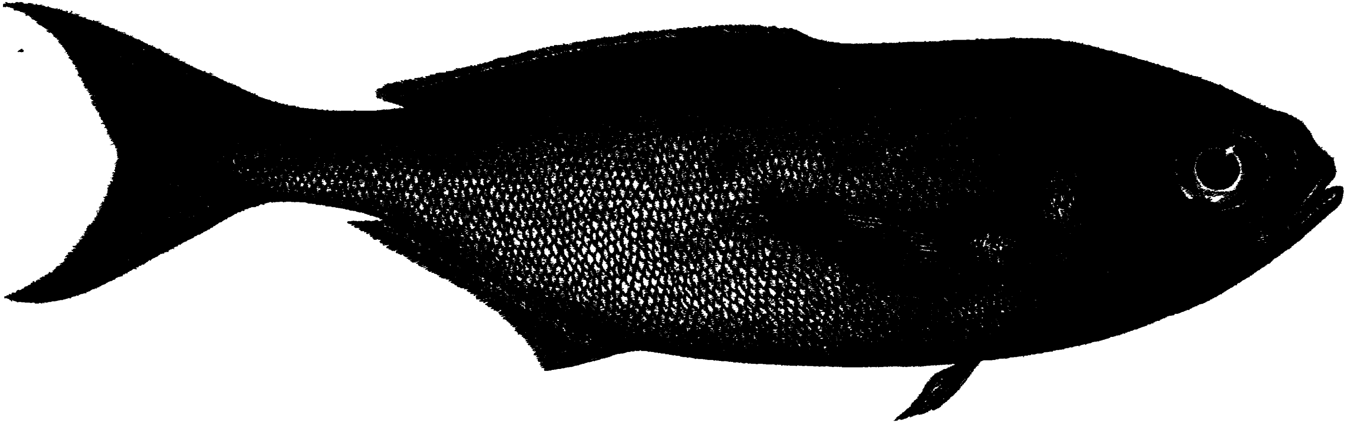
* For explanation of the Plates see pp. 130 & 131.



J Green del lith et imp

1. CONGROMURÆNA MELLISSII. 2. MURÆNA SANCTÆ HELENÆ.

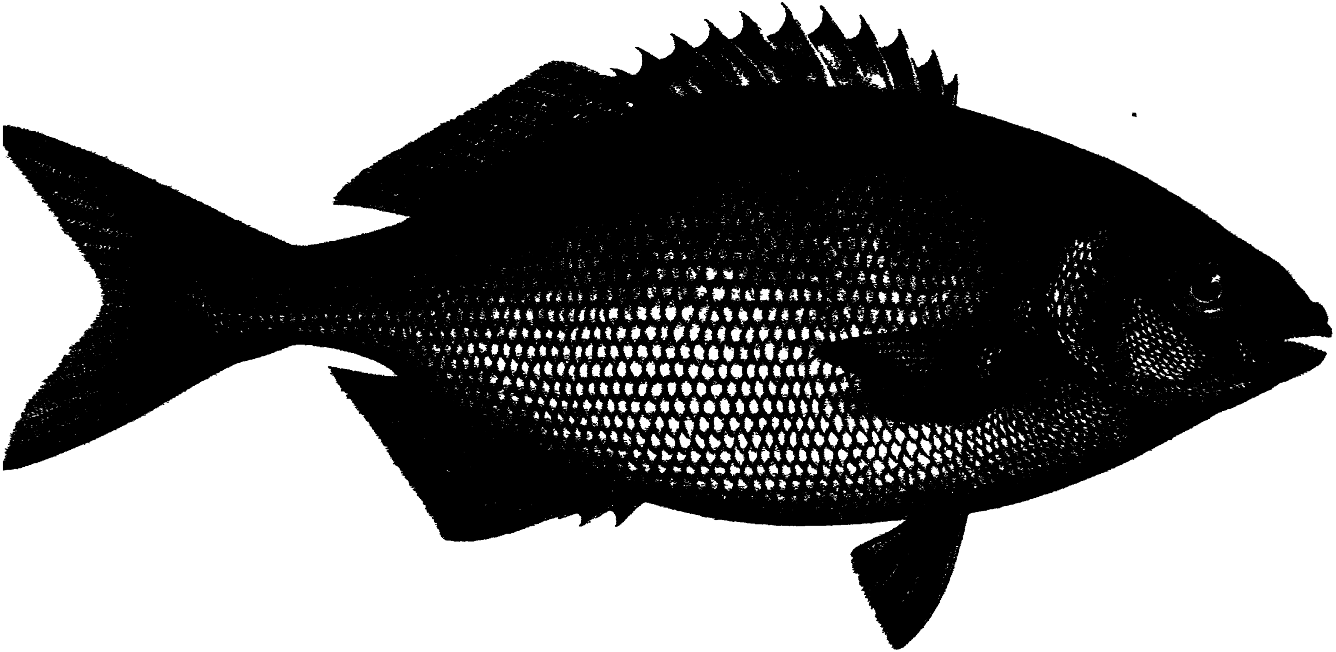
P Z S 1910 Pl V



J Green del lith et imp

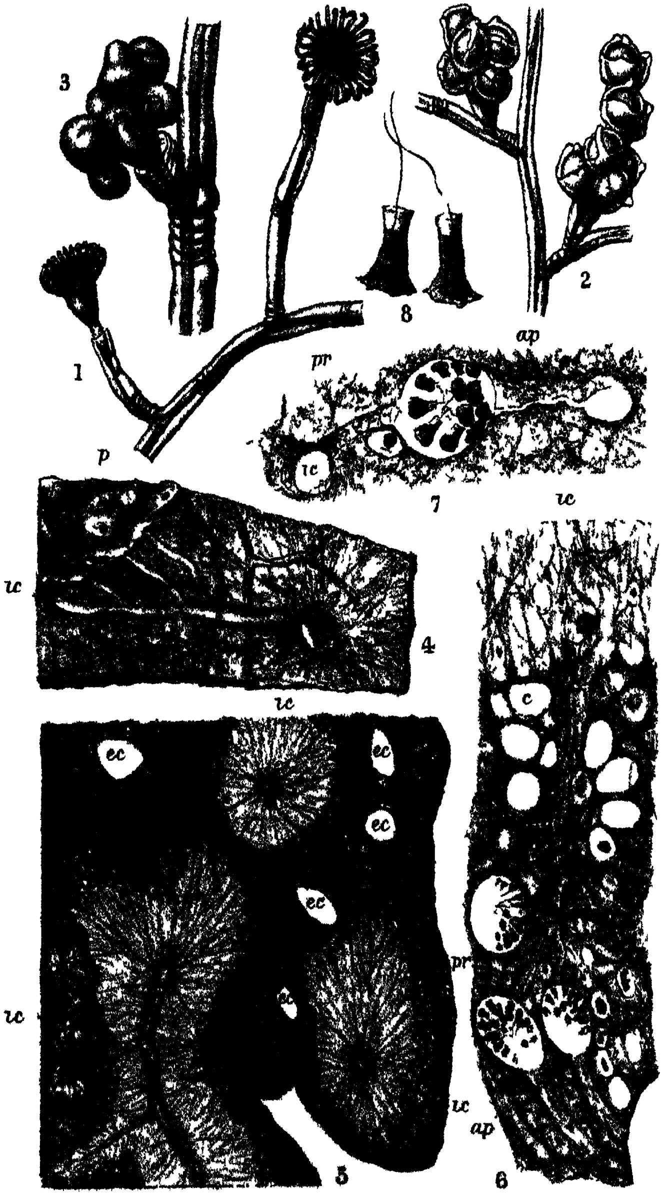
LEIRUS MOSELII

P Z S 1910. Pl. VI.



PIMELEPTERUS GALLVEII

J Green del lith et imp



F.Highley del et lith

J Green imp

1–3. EUDENDRIUM CUNNINGHAMI sp n

4–8. CHONDROSIA PLEBEJA O Schmidt

him in his enquiries concerning the fisheries and to make a Report to the Colonial Office on the results of those enquiries. My Report on the practical and commercial aspect of the subject has been already sent to the Secretary of State for the Colonies; but Mr. Mosely gave me every facility for collecting specimens and doing as much scientific work as was possible in the time available, and the following paper contains the results of my investigations from the scientific point of view.

I took with me a number of nets of the kinds used in England for the purpose of ascertaining by experiment how far English methods and apparatus would be successful in the waters of St. Helena; these consisted of a small otter trawl 15 feet wide at the mouth, a trammel 20 fathoms long and 6 feet deep, a seine 10 fathoms long and 8 feet deep, and two mackerel drift-nets each 20 yards long. I also took a small tow-net of silk bolting cloth. A small spirit tank for carrying preserved specimens was lent to me by the Fish Department of the British Museum (Natural History); and when my collection grew too large for this I was able to obtain tin-lined cases in the island, which were repaired and soldered down when full by a skilled workman whom Mr. Mosely had taken with him to carry out the curing of mackerel and other fish.

We left Southampton on Feb. 6th and arrived at Ascension on Saturday, Feb. 20th, at 4.30 a.m. We landed for a couple of hours and saw the turtle ponds. The female turtle land on the sandy beaches of the island from January to June and are captured by being turned over; they are used as food for the garrison, or rather crew, for Ascension is treated as a ship belonging to the Navy and under the control of the Admiralty. Here also I was interested in the extraordinary numbers of *Balistes* which swarmed around the ship to feed on the orange-peel, pieces of bread, and other refuse thrown overboard. Before arriving at Ascension, soon after passing Cape Verde, we saw for two whole days large numbers of *Velella* at the surface of the sea. They seemed about 4 inches in diameter with the vertical semicircular crest 3 or 4 inches above the surface of the water and of a bright pink colour along its border. I was not able to obtain any specimens, and south of Ascension none were seen. Flying-fish of course were seen in large numbers; they first appeared after we had passed Cape Verde, and continued to be abundant till we were approaching St. Helena, but during my stay at that island I never saw one. I endeavoured to decide for myself the question whether these fishes move their wings in flight, and convinced myself that the pectoral fins were rapidly vibrating or quivering at the moment when the fish left the water, but that afterwards during the flight they were perfectly motionless, so that the motion of the fish is like that of an aeroplane.

We arrived at St. Helena on Monday, Feb. 22nd, a little before midnight, and I spent five weeks on the island. Much of my time was spent in the native fishing-boats, making observations on the different kinds of fishing. The boats are all small and open; the largest are whale-boats about 30 feet long and sharp at both ends: these carry a movable mast on which a sail can be hoisted, but they are more often propelled by oars. These are used chiefly for the albacore-fishing which is carried on off the south-west point of the island; each boat carries a crew of four men. The other boats are a little smaller and have square sterns; they are used for catching mackerel and various other fish, chiefly at night, the albacore-fishing being carried on in daylight. The island is roughly oblong and extends from north-east to south-west, and as it lies in the region of the trade winds blowing always from the south-east, the north-west coast is the lee side, and the sea on this side is always smooth or moderate; hence the open boats are perfectly safe on this side, and here the fishing is usually carried on. Seining was impossible, as there are no smooth sloping beaches on which to draw a seine; at the mouths of the valleys including Jamestown there are beaches of small extent, but they are very steep, are composed of large pebbles, and there is usually a strong surf breaking on them. This surf is due to large smooth waves, locally known as 'rollers,' which come from the north-west, that is, in the direction opposite to that of the wind; their size and force varies greatly from unknown causes, and when they are heavy, landing and embarking at the wharf at Jamestown are rendered somewhat difficult.

I made one trial of the trammel-net, setting it in the evening in about four fathoms of water off Banks' Valley to the east of Jamestown. When hauled a little after sunrise the next morning it contained 11 soldiers (*Holocentrum*), 4 gurnards (*Scorpæna*), 2 flounders (*Platophrys*), 2 rockfish (*Scarus*), 1 stone-brass (*Caranx sanctæ helenæ*), a large *Panulirus*, locally known as long-legs, one *Cidaris* and one feather-star. I only once had an opportunity of going to the windward coast of the island when a small steam-launch belonging to Messrs. Solomons, the shipping agents, towing a whale-boat, took a party as far as a small islet on the south-east coast, called George Island. It had been intended to circumnavigate the island, but the wind and sea increased so much that we were obliged to make for a sheltered bay called Prosperous Bay, where I was able to make a few hauls of the otter trawl. I also trawled on the leeward side a little to the west of Jamestown from the town down to Lemon Valley at a depth of about 30 fathoms, where the net brought up large quantities of the massive coarse sponge identified by Mr. Kirkpatrick as *Chondrosia plebeja* along with the species of *Eudendrium* described below, six specimens of the flat-fish *Platophrys podas*, locally called flounders, three *Scorpæna*, several *Cidaris*, two *Linckia*, and a specimen of *Umbraculum mediterraneum*.

The shores of the island consist everywhere, except at the pebble-beaches at the mouths of the valleys, of black volcanic rock. The cliffs are vertical or nearly so, rising to a height of 700 feet on either side of Jamestown, and at the bases of them is a flat ledge of rock. The tide rises and falls only about two feet, so that there is little room for shore-collecting. One of the most characteristic features is the absence of *Fucus*, *Laminaria*, and all other large seaweeds; the surface of the rock is covered in the rock-pools with green *Ulva* and *Enteromorpha*, and a reddish calcareous alga. There is also another alga, dirty brown in colour, and of small size. Almost everywhere the surface of the rock is closely studded with the holes inhabited by the black boring sea-urchin *Echinometra subangularis*, and on the underside of overhanging ledges the large dark-coloured anemone *Phymactis sanctæ helenæ* is very common.

I did not pay special attention to the terrestrial fauna, but it may be worthy of record here that frogs have been introduced into the island. There were none in 1875 when Melliss' book was published, but at the time of my visit they were abundant in the neighbourhood of the Government House at Plantation and in the stream that runs down the Jamestown Valley, as far as the boundary of the town. The species has been identified by Mr. Boulenger from the specimens which I brought home as *Rana grayi* Smith. This is one of the most abundant species in South Africa, and is common in the neighbourhood of Cape Town, whence specimens were brought to St. Helena some years ago by Miss Moss, a member of one of the resident families, in order that they might furnish a supply of food for ducks. My attention was first drawn to these frogs by hearing their voices in the neighbourhood of Government House. The sound suddenly became audible a little before sunset when it began to rain; it seemed to me like the musical clink produced by tapping glass with a metal rod, in fact it rather suggested numbers of fairy anvils, and was unlike anything I had previously associated with frogs.

There is one species of lizard in the island, doubtless the *Hemidactylus frenatus* Schleg. mentioned by Melliss. I saw one specimen on the veranda of the house where I lodged; it ran into the sitting-room and disappeared into a hole in the wainscot. Two or three large turtles were caught by fishermen and brought to market during my stay; I was informed that they are caught when in the act of copulation, the male and female remaining connected for several days, and when they are in this condition a boat can be brought close to them and one or both of the animals can be easily captured. The method of capture is to seize the animal with a gaff by one of the legs and then to pass a rope round the limb, and so either hoist the turtle into the boat or tow it from the stern. I myself saw a couple of turtles at the surface of the water when I was in a boat rowing down the leeward coast, and we rowed up to the animals, but having no gaff on board were unable to capture them. There are no sandy beaches at St. Helena as at Ascension, and I never heard of any turtles going ashore to lay eggs at the former island. I saw the two giant tortoises which live at Plantation; they are mentioned by Melliss as having been there a century or more in 1875, but the exact date of their introduction is unknown. They came in all probability from one of the Mascarene islands; Melliss suggests that they are of the species *Testudo indica*, but this species is stated by Lydekker to be extinct, and I was not able to ascertain the species with more certainty.

The commonest sea-birds were *Gygis candida* and *Anous stolida*. The former was fairly abundant in the neighbourhood of Jamestown, and some were always to be seen on the ledges of the vertical cliffs at the back of the wharf. It seemed to me that they were breeding there, but I did not confirm this supposition. Melliss states that the bird at St. Helena nests in rocky cliffs and dykes away from the sea, although in other parts of the world it nests in trees. At the request of the late Dr. Bowdler Sharpe I obtained two specimens of a Petrel which he identified as *Oceanodroma castro*; I found it breeding at Egg Island off the coast some miles west of Jamestown, and this was the first evidence of its breeding at St. Helena.

Among land-birds I noticed a mynah, not the species mentioned by Melliss, *Gracula religiosa*, which has become extinct, but *Acridotheres tristis*; the ground-dove *Geopelia tranquilla* from New South Wales; the Java sparrow, *Padda oryzivora*; the so-called cardinal, really the Madagascar weaver, *Foudia madagascariensis*; *Serinus flaviventris*, often called the St. Helena seed-eater, from South Africa; and the wax-bill, known in the island as the avadavat, *Astrilda astrild*, also from South Africa. The latter species is seen in flocks about cultivated lands in the interior of the island. Melliss states that he introduced among other birds 26 London sparrows; but I am glad to say I saw no signs of this impudent little bird, which if it flourished would probably exterminate others much more desirable. For kind assistance in identifying these few birds I am indebted to Mr. Frank Finn.

I have myself worked out the fishes which I collected, but for the identification and annotation of the various groups of invertebrates I am indebted to specialists of the staff of the Natural History Museum. Dr. Calman examined the Crustacea, Mr. E. A. Smith the few Mollusca, chiefly shells inhabited by *Pagurus*, Mr. Jeffrey Bell the Echinoderms, and Mr. Kirkpatrick the specimens of sponge and Hydroid. To all these gentlemen I wish to express my heartiest thanks for their courtesy and assistance. I have thought it best to incorporate their reports in my paper, partly because the specimens in each group were few in number, partly because there is an advantage in keeping the results of my observations on the fauna of the island together. I have also to thank Mr. Boulenger for much friendly help and advice in reference to my work on the fishes. All the expenses of collecting the specimens and bringing them home were borne by Mr. Mosely, and to me personally his generosity and kindness were unfailing. To the Governor, Lieut.-Colonel Gallwey, my sincere thanks are due for his hospitality and for the very friendly interest he took in my work. I have also to thank the residents of the island for much hospitality and the officials for all kinds of help.

Relations of the Fish-fauna of St. Helena.

There are 33 species in my collection, while Melliss in his book, published in 1875, mentions 68. Of those which I obtained the following are peculiar to the island:—

Congromuræna mellissii.
Ophichthys regius.
Leirus moselii.
Pimelepterus gallveii.
Chætodon sanctæ helenæ.
Julis sanctæ helenæ.
Scarus strigatus.
Tetrodon cutaneus.

The rest may be divided into two divisions; those which are confined to the Atlantic, and those which occur also in the tropical and subtropical Pacific.

Species confined to the Atlantic.

Muræna unicolor.
Muræna moringa.
Muræna sanctæ helenæ.
Holocentrum longipinne.
Epinephelis ascensionis.
Sargus capensis (also Muscat).
Caranx dentex.
Lichia glauca.
Platophrys podas.
Scorpæna scrofina.
Salarias textilis.
Ostracion quadricornis.

Species common to the Atlantic and Pacific.

Saurus myops.
Priacanthus boops.
Priacanthus cruentatus.
Cossyphus pectoralis.
Caranx sanctæ helenæ.
Caranx ascensionis.
Scomber colias.
Thynnus alalonga.
Thynnus albacora.
Thynnus obesus.
Gymnosarda alleterata.
Thyrsites prometheus.
Balistes buniva.

In order to ascertain in a general way the affinities of the St. Helena fishes, we may enquire what species that island has in common with the Cape, with the West Indies, and with the Mediterranean. The following lists show which of the species collected by me occur in these several regions.

Species found also at the Cape.

Epinephelus ascensionis.
Priacanthus boops.
Sargus capensis.
Lichia glauca.
Scomber colias.
Thynnus alalonga.

Species found also in the Mediterranean.

Muræna unicolor.
Caranx dentex.
Lichia glauca.
Scomber colias.
Thynnus alalonga.
Gymnosarda alleterata.
Platophrys podas.

Species found also at the West Indies.

- *Muræna sanctæ helenæ* (Bermudas).
- *Muræna moringa.*
- *Holocentrum longipinne.*
- *Epinephelus ascensionis.*
- *Priacanthus cruentatus.*
- *Sargus capensis* (Bermudas).
- *Caranx dentex* (Bermudas).
- *Scomber colias.*
- *Thynnus albacora.*
- *Thyrsites prometheus* (Bermudas).
- *Platophrys podas* (Cuba ?).
- *Balistes buniva.*

According to E. A. Smith in his paper on the Marine Mollusca of St. Helena, P. Z. S. 1890, the molluscan fauna of the island resembles that of the West Indies, fifty per cent. of the specimens from St. Helena being common to the two localities. The similarity shown by my small collection of fishes is not nearly so great, the proportion of West Indian species, including those found at the Bermudas, being only 11 out of 33, and if we exclude the Bermudas and omit *Platophrys podas*, which is doubtful, we have only 6 out of 33. A few of the species occur both in the Mediterranean and at the Cape, namely *Lichia glauca*, *Scomber colias*, *Thynnus alalonga*, and probably *Caranx dentex*, which certainly occurs at Port Natal (Durban). The few remaining species show no special affinity of the St. Helena fauna with either the Mediterranean or the Cape. On the other hand, a vast number of Mediterranean and South African species do not occur at St. Helena, these being northern and southern temperate forms which are probably excluded by temperature. In fact, if we omit the oceanic forms of wide distribution, such as the species of *Thynnus*, the shallow-water fishes of St. Helena are few in number of species; and the fact that such a large proportion are peculiar to the island, shows how isolated the fish-fauna is, in spite of the fact that the eggs and larvæ are pelagic. The fauna belongs to the tropical Atlantic, but comparatively few of the species of this fauna have established themselves on this small and isolated area in mid-ocean, and the arrival of new individuals from other regions must be a rare occurrence.

With regard to the species common to the Atlantic and Pacific, it is an interesting question whether there is any interchange of individuals between the two oceans or whether the populations of the same species have been isolated since the oceans were separated by the elevation of the Isthmus of Panama. If there is any interchange it must take place round the Cape of Good Hope, as warm-water fishes are not likely to travel round the cold shores of Cape Horn, and at the African cape the cold Benguela current from the Antarctic offers an obstacle. *Scomber colias* is common at the Cape, but not known in the Indian Ocean. *Thynnus alalonga* occurs in South African waters, but the other species of *Thynnus* are not recorded. *T. albacora* occurs at Muscat, and both this species and *Gymnosarda alleterata* are taken on the coasts of India and the East Indies, but not at the Cape.

CONGROMURÆNA MELLISSII. (Plate IV. fig. 1.)

Congromuræna mellissii Günther, B. M. Cat. Fishes, viii. p. 42; Melliss.

The Silver Eel, Melliss.

I obtained one specimen of this species, which was caught on a bottom line from a boat moored off Egg Island in about 35 fms.; it was 18 inches long, of uniform yellowish grey colour. This species is peculiar to St. Helena, and only a single specimen of it, presented by Melliss, was in the National Collection until mine was added.

MURÆNA SANCTÆ HELENÆ. (Plate IV. fig. 2.)

Muræna sanctæ helenæ, Günther, B. M. Cat. Fishes, viii. p. 115: Melliss.

The Bird's-eye Conger, Melliss.

I bought a specimen of this species in the market. It was 34 inches long; it has speckled markings on a chocolate ground, each mark being a group of white dots. It was a female nearly ripe, the eggs about 1 mm. in diameter, opaque, without oil globules, with thick vitelline membrane. On the inner surface of the peritoneum were oval white bodies apparently of parasitic nature. Günther gives the length of the head as $\frac{2}{5}$ that of the trunk, which means the length from the gill-opening to the anus; if we take the length from snout to anus, the head is contained in this $3\frac{1}{2}$ times. The markings in Melliss' specimen which is in the Museum are larger and more conspicuous than in mine. The long teeth are hinged so as to bend down flat inwards and posteriorly.

Melliss states that this species is peculiar to the island, but there is now in the Museum a specimen from the Bermudas and another received from the Smithsonian Institution. The Madeira form *Muræna anatina* is similar but distinct.

MURÆNA UNICOLOR.

Murænophis unicolor De la Roche, Ann. Mus. xiii. 1809, p. 359, fig. 15.

Muræna unicolor Risso, Ichth. Nice, p. 368; Günther, B. M. Cat. Fishes, viii. p. 125; Melliss.

The Brown Eel or Grig, Melliss.

My specimen of this species was also bought in the market. It is 31 inches long. It agrees with Günther's description except that he does not mention the vertical ascent of the forehead above the eyes; the top of the head forms a hemispherical enlargement which is continued behind into a very thick neck, while the snout is pointed and narrow. There is a narrow edging of yellow round the vertical fins posteriorly from the anus and the opposite dorsal point to the caudal extremity. When the specimen was handled I noticed a liquid running from it which appeared to be milt; under the microscope particles were seen in this liquid which resembled the heads of spermatozoa, but none of them possessed tails. When the specimen was opened a narrow testis was found on each side not more than ¼ inch in breadth. When a piece of the testis was teased up and examined microscopically, particles like those seen in the supposed milt were seen, and I concluded that these were ripe spermatozoa which had undergone partial decomposition, the specimen having been dead some time. I concluded that the specimen was a male which had spawned and was almost entirely spent, and as it had been taken with bait and its stomach was full of food, it is evident that this species of *Muræna* does not die after spawning like the common conger and the freshwater eel of Europe.

It occurs also in the Mediterranean, at Madeira, and the Azores.

MURÆNA MORINGA.

Muræna moringa Cuv. Règne Anim.; Günther, B. M. Cat. Fishes, viii. p. 120; Melliss.

Murænophis rostrata Casteln. Anim. Am. Sud, Poissons, p. 80, pl. xlii. fig. 1.

Murænophis curvilineata ibid. p. 81, pl. xlii. fig. 2.

Common Conger, Melliss.

This species has innumerable confluent brownish-black spots separated by a fine network of the white ground-colour. The teeth are uniserial with a diastema behind large canines in the mandible and two long vomerine teeth which are hinged. I obtained a single specimen 32½ inches long from an albacore-boat when I was out in another; it occurs also at Bahia and the West Indies. All the Murænas are called congers at St. Helena and this one is known as the common conger, but the true *Conger vulgaris* of Europe, according to Melliss, is also abundant, although I did not meet with a specimen. This species occurs in various parts of the tropical Atlantic; specimens in the National Collection come from Bahia, Ascension, Jamaica, Cuba, and St. Helena.

OPHICHTHYS REGIUS.

Ophisurus regius (Shaw) Richards. Voy. 'Erebus' and 'Terror,' Fishes, p. 106.

Ophichthys regius Günther, B. M. Cat. Fishes, viii. p. 66; Melliss.

Sea-Snake, Melliss.

This species is characterized by the single series of large conspicuous brown spots on a grey ground along each side of the body, with smaller spots in between. I obtained only one specimen, which was caught on a mackerel-line off Egg Island; it is 27½ inches long.

Peculiar to St. Helena.

SAURUS MYOPS.

Salmo myops (Forster) Bloch Schn. Syst. 1801, p. 421; Forst. Descr. Anim. ed. Lichtenst. p. 412.

Saurus trachinus Schleg. Fauna Japonica, Poiss. p. 231, pl. cvi. fig. 2; Cantor, Malay. Fish. p. 271.

Saurus myops Cuv. Règne Animal; Cuv. & Val. xxii. p. 485; Melliss.

Sand-spear, Melliss.

I caught one specimen of this species about a foot long in about 20 fms. in Flagstaff Bay. It is cylindrical in shape with a dorsal fin in the middle of the back and a small adipose fin further back. The ventral fin is extensive, reaching from the anus to the root of the tail. The pectorals are small, the pelvics much larger and thoracic in position; the mouth is enormous, extending far behind the eyes which are placed close together on the top of the head; the gill-openings also are very wide. Small pointed teeth in a single row on the jaws and some on the tongue. The scales are of moderate size. The back is dark brownish with seven darker transverse bands; on the sides are several longitudinal lines of yellow. The specimen was a male with nearly ripe milt. This description is from the notes I made when I examined the fresh specimen, and the colours described may not be visible in spirit specimens. The fish lives in the sand with its eyes protruding.

LEIRUS MOSELII, sp. n. (Plate V.)

B. 6; D. I, 25; A. II. 21; P. 22: V. I, 5. Lat. line 95.
Sc. trans. 20/32.

The most peculiar character is the posterior position of the dorsal fin which commences at a point whose distance from the end of the snout is 1½ times the length of the head.

Anterior part of the dorsal surface in front of the dorsal fin flat and scaled, with no trace of fin structures; a fleshy elevation at the commencement of the fin, the base of which and of the anal is imbedded and covered with scales. The single dorsal spine and the two anal spines not separate from the rest of the fin and imbedded so that they could only be detected by dissection. Anus at about the middle of the body and ventral fin (anal) commencing immediately behind it. Length of head $3\frac{3}{5}$ in length of body measured from end of snout to end of middle caudal rays. Front of head very obtuse, skin of its upper surface and round the eye scaleless and porous, but the pores not so conspicuous as in *Leirus perciformis*. Preoperculum with radiating ridges which project from the edge as very minute spines; edge of operculum with still more minute spinules. Operculum and preoperculum partially scaled. Eye large, its diameter $3\frac{3}{5}$ in length of head; no vertical lids, but a circular ridge round the orbit. Upper rays of pectoral fin elongated, reaching a quarter of their length beyond the commencement of the dorsal; pelvic (ventral) fins about half the length of the pectoral. Caudal emarginate and wide. Caudal peduncle very nearly half the length of the head, its height contained 1¼ times in its length. Body oblong ovate, slightly compressed. Mouth rather small, angle of the gape extending to below the vertical from anterior margin of orbit. Posterior end of maxilla exposed with small supplemental bone. Coloration brown above, paler below.

The above description is taken from a single specimen measuring from the snout to the end of the middle caudal rays 72 cm. or 28¼ inches, its greatest depth of body being 21·5 cm. or 8⅗ inches. It was brought to me by some fishermen who called it a cod and said it had been taken in an albacore-boat, which would imply that it had been caught at a depth of 70 to 80 fathoms off the south-west point of the island. It was already eviscerated when I received it, even the gills having been cut away. I was therefore unable to examine the œsophagus to ascertain whether the tooth-bearing lateral sacs were present; but the external characters are so similar to those of other members of the family Stromateidæ that there can be no doubt that the fish belongs to that family. The peculiar character of the dorsal fin is so different from that of previously known species that I was for some time inclined to propose a new genus for the fish, but in its other characters it agrees so closely with the species of *Leirus* that I have decided for the present to place it in that genus. The generic characters of the Stromateidæ, as given by Tate Regan in his revision of the family, are in most cases not very strongly marked; thus my specimen in many of its characters resembles species of *Seriolella*, especially *S. velaini* as described and figured by Sauvage, as much as it does the species of *Leirus*. It has similar falciform pectorals and the scales are not deciduous; these characters occur, however, also in some species of *Leirus*. In fact, the only character distinguishing *Leirus* and *Centrolophus* from *Seriolella* and other genera is that in the two former the lateral line becomes straight before reaching the caudal peduncle, and my specimen possesses this character. The spines of the dorsal fin are reduced and variable in the family generally and in *Leirus* in particular, and it is possible that in younger and smaller specimens of the St. Helena species an anterior spinous portion of the dorsal may exist, although there is no sign of this in my specimen, and in other species, such as *Leirus ovalis*, the larger specimens have not lost the anterior spines; on the other hand, these spines are known to disappear with age in some species of the Carangidæ. The separation of *Centrolophus* from *Leirus* is not founded on very well marked characters, but merely on the greater elongation of the body and the slipping of the maxilla under the preorbital which is a matter of slight degree. Regan adds another character, namely, that each scale is pierced by a pore, but I have found on examination of specimens in the

Natural History Museum that this is not the case; the scales are not pierced, but when the scale is removed and the thin membrane beneath it also, a cavity is visible in the centre of the scale-area.

I have named the new species in honour of Mr. Alfred Mosely.

HOLOCENTRUM LONGIPINNE.

Holocentrum longipinne Cuv. & Val. iii. p. 185; vii. p. 496; Günther, B. M. Cat. Fishes, i. p. 28; Melliss.

The Soldier, Melliss.

Certain sexual differences exist in this species which are not mentioned in Günther's Catalogue. In the male the pelvic fins reach only two-thirds of the distance from their base to the anus, in the female they extend to the anus; in the male their length is contained more than 3⅔ in the total length exclusive of the caudal fin, in the female it is contained only 3 times in the total length. The body is shorter and stouter in the female than in the male; in the former the height of the body is contained twice in the total length without caudal, in the male 3 times.

This species is regularly seen in the market, where I obtained my first specimens. It is taken in shallow water along the coast in company with *Scorpæna scrofina*; in my experiment with the trammel off Banks' Valley I caught eleven specimens, but in the trawl I caught none, from which it would appear that it occurs only in the shallowest water close to the shore.

It occurs also at Ascension, the Bermudas, the West Indies, and the coast of Brazil.

EPINEPHELUS ASCENSIONIS.

Trachinus ascensionis Osbeck. Voy. China, ii. p. 96; Cuv. & Val. vi. p. 517.

Serranus impetiginosus Müll. & Trosch. in Schomburgk's Hist. Barb. p. 665; Melliss, p. 103.

Epinephelus ascensionis Jord. & Swain., Proc. U.S. Nat. Mus. vii. 1884, p. 391; Boulenger, B. M. Cat. Fishes, 2nd ed. i. p. 228.

St. Helena Jack, Melliss.

This species is marked with reddish-brown spots regularly distributed all over the body. It is common and considered a very good table-fish; it occurs close to the shore as well as in moderate depths, and is caught either by fishing from the rocks or from a boat. The first specimen I saw was obtained from a man who had been fishing from the landing-steps in the early morning; it was 9 inches long, and was a female not ripe. Others were caught on the windward side of the island, off George Island and in Prosperous Bay. It appears to be confined to the tropical and subtropical Atlantic, having been taken at Ascension, Barbados, Trinidad, and Bahia; also at the Cape.

PRIACANTHUS BOOPS.

Anthias boops (Forst.) Bloch Schn. Syst. 1801, p. 308.

Priacanthus boops, part., Cuv. & Val. iii. p. 103; Boulenger, B. M. Cat. Fishes, 2nd ed. i. p. 357; Melliss.

Priacanthus japonicus Cuv. & Val. iii. p. 106; Schleg. Faun. Japon., Pisces, p. 20.

The Deep-water Bull's-eye, Melliss.

This species is distinguished from all the others of the genus by the last dorsal spine being more than twice as long as the second. The membrane of the pelvic fins is black, but there is little black on the sides. I saw some of these fishes caught when I was out in an albacore-boat moored in about 80 fms.: when alive they were of a beautiful crimson-red all over except the belly, and the enormous eyes were perfectly clear and transparent, fully justifying the name Bull's-eye, suggesting the convex lens of a bull's-eye lantern. I opened one of the eyes and found there was no black pigment visible on the inner surface, but a bright silvery argenteum over the whole of the choroid. The black pigmented epithelium of the retina would appear to be also wanting, since, if present, it would lie in front of the choroid. This condition is evidently related to vision in a dim light, and is comparable to the tapetum of crepuscular and nocturnal mammals such as the Felidæ. It has been suggested that the retina in such eyes is more sensitive in the presence of slight diffused light reflected from the tapetum, but it seems possible that the tapetum or argenteum may have the power of rendering dark rays more visible by altering their refrangibility at the moment of their impact on the tapetum which is in contact with the rods and cones of the retina: in other words, the tapetum may be fluorescent.

In the British Museum Catalogue this species is not recorded from the West Indies, but from the South Atlantic, S. America, Cape of Good Hope, Muscat, and Japan.

PRIACANTHUS CRUENTATUS.

Labrus cruentatus Lacépède, Poissons, iii. p. 522.

Priacanthus carolinus Less. Voy. Coquille, Poissons, p. 224.

Priacanthus boops Val. in Webb & Berthelot, Iles Canar., Ichth. p. 12.

Priacanthus blochii, part., Günther, B. M. Cat. Fishes, i. p. 218; Day, Fish. Ind. p. 48, pl. viii. fig. 2.

Priacanthus cruentatus Boulenger, B. M. Cat. Fishes, 2nd ed. i. p. 352.

Priacanthus sp.? Melliss.

The Bull's-eye, Melliss.

D. X, 13; V. III, 14. Lat. line over 100.

The above numbers are from a single specimen 10 inches long in my collection. Both this species and *P. boops* are abundant at St. Helena, this one being usually taken by fishing from the rocks or near the shore at night, while the other is taken in deep water, 70 to 100 fms., in daytime. Both are excellent table-fish, but the present species is only about half the size of the Deep-water Bull's-eye, not usually exceeding a foot in length. Both are of a general red colour, but in *cruentatus* the colour is darker and there is more black on the sides. In the present species the scales are smaller and the lateral line has a much steeper curve behind the head; the eye is larger in proportion to the head and the rays of the dorsal and ventral are not so rough, in fact the soft rays are quite smooth. According to the British Museum Catalogue, *P. cruentatus* occurs in the tropical and subtropical Atlantic, as well as in the Pacific and Indian Oceans, the localities mentioned being Bermuda, Jamaica, West Indies, west coast of Mexico; also Zanzibar, Samoa, Tahiti, and the East Indies.

PIMELEPTERUS GALLVEII, sp. n. (Plate VI.)

D. XI, 12; A. III, 11. Lat. line 80+. Trans. sc. 13 or 14/20.

Soft portion of dorsal much higher than last spine; head 4¼ in total length, measured to end of middle caudal rays; eye 4¼ in length of head. Height 2½ times in total length. Horizontal portion of teeth 1½ times as long as the vertical measured inside, equal in length to the vertical measured externally.

Length of single specimen examined 15¼ inches to end of middle caudal rays.

I obtained only one specimen of this genus, and it does not appear to agree with any of the species previously described. It differs from *P. boscii* Lacép., which occurs at Madeira, in having smaller scales and a smaller eye; in *fuscus* Lacép., which is found at the Cape, the end of the spinous portion of the dorsal and the soft dorsal are about equal in height, whereas in my specimen the soft portion is much higher than the last spine; it differs from *P. elegans* Peters, in having smaller scales with their posterior apices more pointed and the body is less elongated. It resembles *P. analogus* Gill most closely, but in the latter there is less difference in height between the end of the spinous and the beginning of the soft portion of the dorsal, and the colour in my specimen is a bluish grey, while that of *analogus* is reddish brown. In *P. leutescens* Jordan & Gilbert, again, the eye is larger and the posterior apices of the scales more pointed.

The specimen was called a bream by the fisherman from whom I bought it, the English name usually applied to fishes of the family Sparidæ. Melliss mentions a fish known as the bream at St. Helena, but he saw no specimens; it does not seem to be caught very often.

I have named the species in honour of the Governor of St. Helena, Lieut.-Colonel Gallwey.

SARGUS CAPENSIS.

Sargus capensis Smith, Ill. Zool. S. Africa, Fishes, pl. 23. fig. 2; Günther, B. M. Cat. Fishes, i. p. 442; Melliss.

Old Wife, Melliss.

I brought back two specimens, one 10 inches long, the other 7 inches, which agree with Günther's description, except that in the larger the pectoral extends only to the commencement of the ventral, not to the second soft ray of that fin. This is one of the most abundant fishes at St. Helena, occurring along the shore and everywhere at moderate depths. I caught specimens off the wharf, to the east of Jamestown and on the windward side off George Island. It is common at the Cape and along the coast of S. Africa, and occurs also at the Bermudas and at Muscat, on the coast of Arabia.

CHÆTODON SANCTÆ HELENÆ.

Chætodon sanctæ helenæ Günther, B. M. Cat. Fishes, vol. ii. MS.; Melliss.

The Cunning-fish, Melliss.

The colours of this Chætodont, although pretty, are not so conspicuous as in the majority of the species in other parts of the world, a fact which is perhaps related to the absence of corals and the sombre colours of the rocks at St. Helena. The sides are silvery white ventrally, light mauve dorsally, and a band of bright yellow passes all round the body along the dorsal and ventral fins and across the caudal peduncle, the caudal fin itself being almost colourless. The fish is very abundant and very fearless, although at the same time not easy to capture by hook and line, as its mouth is small and it seems to know how to avoid the hook and tear away the bait, hence its local name of Cunning-fish. In ordinary circumstances not one may be seen in the water from the wharf or the landing steps, but as soon as any refuse is thrown in dozens or hundreds appear to feed on it. I tried to catch them with a small seine shot round the fishermen's steps, but as soon as the net was hauled in they simply escaped under its lower edge. I then used a mackerel-net, keeping the foot-line on the steps and the buoyed head-rope some distance out with the loose net hanging below the surface of the water; then by means of bait I enticed the fish over the net, and by raising the edge which had been under water I captured more than a hundred at one haul. I found they were almost ready to spawn, milt or eggs running from many of them when the abdomen was squeezed. Some of the eggs were ripe enough to float in sea-water; they were transparent, about 1 mm. in diameter, with a single yellowish oil-globule.

This species and *C. dichrous* Günther, of which I did not obtain a specimen, are peculiar to St. Helena, being found nowhere else in the world, while at the same time they are the only species of the genus which occur at the island.

JULIS SANCTÆ HELENÆ.

Julis sanctæ helenæ Cuv. & Val. xiii. p. 382; Günther, B. M. Cat. Fishes, iv. p. 191; Melliss.

The Green-fish, Melliss.

The following are the notes I made from the examination of a fresh male specimen at St. Helena:—The colours are chiefly bright blue and green; the dorsal and ventral fins are blue with a red band running along the middle of each fin for its whole length. The tail has a vertical edge in the middle, but the dorsal and ventral rays are prolonged for about 1¼ inch. A dark, almost black, colour covers the top of the head and extends as a broad band along the side dorsally, but above this band at the base of the fin the colour is bright blue. A narrow band of bright blue extends from the base of the eye to the angle of the mouth, and behind the eye on the operculum is a dull brick-red band. The operculum is blue, the belly is green inclining to yellow. The testes were narrow and elongated, but apparently ripe; in the stomach was an unidentified crustacean with curiously toothed chelæ. I did not carefully compare this male with a female with regard to the prolongation of the caudal lobes, and the two specimens I brought home are not sufficiently well preserved to show the sex with certainty; but in one of them, 10¼ inches long, which appears to be female, the caudal lobes extend only ⅝ in. beyond the posterior margin of the fin.

This species is very common about the wharf at St. Helena, and makes the capture of other fishes with rod and line difficult by its propensity to seize the bait as soon as it is put into the water. It is used as food. It is peculiar to St. Helena.

COSSYPHUS PECTORALIS.

Harpe pectoralis Gill, Proc. Acad. Nat. Sc. Philad. 1862, p. 141.
Cossyphus pectoralis Günther, B. M. Cat. Fishes, iv. p. 110.

Originally described from the coasts of Lower California. Günther states that the colour is brownish yellow, which is the colour of a specimen 9½ inches long which I brought home. Gill says that the colour during life is blue. This species, like the Green-fish, is taken from the wharf or the rocks by hook and line, but is less common.

SCARUS STRIGATUS.

Scarus strigatus Günther, B. M. Cat. Fishes, iv. p. 212; Melliss.
The Rock-fish, Melliss.

I obtained one specimen among a mixed lot of fish bought from a man who had been fishing with rod and line from the landing-steps at the wharf. It was rather less than a foot in length. In colour it does not agree with Günther's description, "olive (in spirits)," although the specimens from St. Helena in the Museum collection, collected by Bannerman, resemble mine. The general colour of my specimen is a light brick-red; on the posterior half of the side below the lateral line is a violet-black patch not extending to the ventral edge; the snout is black dorsally, with patches of cream-colour, the chin is violet; each scale has a darker centre. The scales are very large, and the teeth form a beak divided above and below. The body was deep and the abdomen swollen, but no spawn exuded on pressure. On opening the abdomen I found that the specimen was female, with enlarged roes, but the eggs were not ripe; the largest were still opaque, with several oil-globules, probably pelagic with a single oil-globule when ripe. The contents of the intestine consisted of dark grey sandy matter, in which, under the microscope, were found triradiate sponge-spicules, one small crustacean, and numbers of curious elongated structures of colourless granular appearance and variable breadth. They may have been vegetable growths living in the intestine or perhaps in the sand that the fish swallows; they were certainly not Gregarines.

The habitat of the original single specimen in the British Museum Collection was not known, but two specimens were subsequently received from St. Helena. It seems to be confined to the shores of this island, not having been recorded from any other locality.

CARANX SANCTÆ HELENÆ.

Caranx sanctæ-helenæ Cuv. & Val. ix. p. 37.

Caranx jacobæus Cuv. & Val. ix. p. 42.

Caranx muroadsi Temminck & Schlegel, Fauna Japonica, Pisces, p. 108, pl. 58. fig. 1; Günther, B. M. Cat. Fishes, ii. p. 425; Melliss.

Kingston and Stonebrass, Melliss.

The Stonebrass and Kingston are identical, the latter being the adult. Average specimens which I brought home measured 10¾ and 15¼ inches respectively. A single posterior ray of the dorsal and ventral fins is detached, forming a rather long finlet; the posterior scales of the lateral line are keeled.

The young of this species, known as Stonebrass, are very abundant at St. Helena. Whenever I was out fishing for mackerel off Egg Island, swarms of these fishes could be seen around the boat feeding greedily on the pounded mackerel or "mince" thrown over to attract the mackerel. They were never caught on the mackerel-hooks, probably because these were too large for their mouths, but when mackerel were scarce the men fished for Stonebrass by two different methods: one method was with a bamboo-rod and short line furnished with a small hook and baited with mackerel; the other was to collect a number of the fishes in a dense shoal by throwing over a handful of mince, and then to draw rapidly through them a bunch of sharp hooks on the end of a short line weighted with a lead; in this way the Stonebrass were foul-hooked. Stonebrass are of little value in the market, and are caught usually when mackerel are scarce, as bait for albacore-fishing.

Kingstons are occasionally caught on the mackerel-lines; but I saw very few caught in this way, namely three on March 6th and one on March 10th; the latter was a ripe male exuding milt, so that the fish evidently spawns in March, but I did not identify the eggs.

This species is widely distributed in the Pacific as well as in the Atlantic, occurring in Japan, at Tahiti, Raratoa, and Jalisco, Mexico.

Caranx muroadsi Schlegel, of Japan and China, is very closely allied, differing only in the fin-ray formula by one or two rays, and by having a few more keeled scales in the lateral line.

CARANX DENTEX.

Scomber dentex Bloch Schn. Syst. 1801, p. 30.

Caranx dentex Cuv. & Val. ix. p. 87; Günther, B. M. Cat. Fishes, ii. p. 441; Melliss.

Caranx analis Cuv. & Val. ix. p. 88; Webb & Berthelot, Iles Canar., Poiss. p. 57, pl. xii.

The Cavally, Melliss.

The specimen which I brought home agrees with Günther's description, except that there are no teeth on the tongue, and the head is contained 3 times in the total length instead of 3¾; the latter difference is apparently due to the fact that Günther measured to the end of the forked tail while I measured to the end of the middle caudal rays. The Museum specimen which I compared, one collected by Melliss at St. Helena, is 14½ inches long, while mine is 17 inches. The Museum specimen has a few median teeth at the front of the tongue; these teeth are therefore deciduous. The lips both above and below are thick and fleshy and covered with papillæ; the upper jaw is protrusible.

This fish is plentiful at St. Helena and considered one of the best table-fish. I saw two caught on a bottom line in an albacore-boat moored in about 80 fms. off the S.W. point of the island, and another on the windward side off George Island, as well as others landed by the fishermen. It is a species of wide distribution in the Atlantic, being well known in the Mediterranean, and occurring also on the coast of Brazil, the Cape Verde Islands, Madeira, Canary Islands, the Bermudas, and Port Natal.

Caranx ascensionis Cuv. & Val. ix. p. 102, pl. 249, occurs at St. Helena, Kingsmill Island, Samoa, Ascension, and St. Paul's Rocks, but I did not get a specimen. Melliss sent it from St. Helena, but it is not mentioned in his book.

"Neck very much elevated" seems the principal character in Günther's description.

LICHIA GLAUCA.

Scomber glaucus Linn. Syst. Nat. i. p. 494.

Lichia glaucus Risso, Eur. Mérid. iii. p. 429.

Lichia glauca Günther, B. M. Cat. Fishes, ii. p. 477; Melliss.

The Silver-fish, Melliss.

Length of specimen examined 9¼ inches. This species is common at St. Helena and forms part of the regular fish-supply, being caught near the shore either from the rocks or from a moored boat. The first fishes I caught at the island were two Silver-fish which were meshed in mackerel-nets with which I was experimenting on the eastern side of Jamestown. I opened one of them and found it had a large simple air-bladder, long gill-rakers on the first gill-bar but not on the others; in the intestine I recognized a Copepod. It was a male, the testes being large and ripe, with milt running from them, so that this species, like several others at St. Helena, spawns in February and March; probably small pelagic eggs with a single oil-globule, which I found in the tow-net collections taken at the time the fishes were caught, belonged to this species. It is caught at night, and its appearance when first taken from the water is beautifully silvery. The species has a wide distribution in the Atlantic, ranging from the south coast of England to the Cape; it is common in the Mediterranean, and is found at Madeira, Cape Verde, Ascension, Mogador, and the coast of Brazil.

SCOMBER COLIAS.

Scomber colias Gmelin, Syst. Nat. 1788 (Sardinia); Cuv. & Val. viii. p. 39, 1831; Storer, Fishes Massachusetts, 1839; Steindachner & Döderlein, Beiträge zur Kenntniss der Fische Japans, iii., 1885; Kitahara, Journ. Fish. Bur. Tokyo, 1897.

Scomber pneumatophorus de la Roche, Ann. Mus. Hist. Nat. xiii., 1809; Cuv. & Val. viii., 1831; Günther, B. M. Cat. Fishes, ii. 1860 (St. Helena, Madeira); Poey, Enum. Pisc. Cubens. 1875; Jordan & Gilbert, Proc. U.S. Nat. Mus. 1880 (Monterey Bay).

Scomber macrophthalmus Rafinesque, Indice d'Ittiologia Siciliana, 1810.

Scomber grex Mitchill, Trans. Lit. & Phil. Soc. N. Y. 1815.

Scomber diego Ayers, Proc. Cal. Acad. Sci. 1856.

It is generally agreed that the union of *S. colias* and *pneumatophorus* by Steindachner is correct, and the literature above quoted shows that the species has a very extensive range, from the Mediterranean to Japan through the southern parts of the Atlantic and Pacific. It is mentioned under the name *pneumatophorus* in Gilchrist's South African list, and was stated, under the name *S. grex*, by Cuvier to be very common at the Cape. Cuvier also received specimens from St. Helena. It is recorded by Steindachner from the coast of Chili; but on the other hand has not been observed in Indian or East Indian seas; Day (Fishes of India), and Bleeker (Verh. Batav. Genootsch. xxiv. 1852) make no mention of it.

At St. Helena mackerel are taken only by hook and line and the fishing is carried on only at night, that is after sunset. My experiments showed that they do not bite in daylight and that it is not possible to catch them in the English method by drift-nets. Evidently these fishes are nocturnal and remain in deep water during the daytime, rising to the surface at night. The fishing is carried on from a moored boat, and loose bait, consisting of boiled mackerel pounded to a pulp, is thrown overboard from time to time to attract the fish; this bait the native fishermen call "mince." The water is wonderfully transparent, and even when there is no moon it is never quite dark. I was able to see the bait on the hook to a depth of three fathoms, and there is no doubt that the mackerel were able to see my nets and avoid them; the largest number I caught in the nets at one time was five. These nocturnal habits explain why the eyes in *Scomber colias* are so much larger than in *S. scombrus*, and this is therefore an instance of a specific character which is adaptive.

In my specimens the diameter of the eye is contained 3½ to 3¾ in the length of the head. The presence of the air-bladder may also be adaptive, enabling the fish to adapt itself to great changes of depth. The mackerel at St. Helena are mostly from 11 to 13 inches in length: the largest I measured was 13½ inches long and weighed 1¼ lb.

When I arrived at St. Helena at the end of February the mackerel were nearly ripe, but I never obtained any quite ripe and spawning, doubtless because they cease to feed for a time when in this condition. In the material collected by the tow-net were eggs with a single oil-globule, some of which probably belonged to the mackerel, but I was not able to identify them with certainty. After March 10th fewer mackerel were caught, and on March 24th I opened a dozen in which the roes and milts were small and collapsed and apparently spent; I concluded that these had recently spawned and that spawning takes place in March.

Mackerel are caught at St. Helena all the year round. In February and March the fishing was carried on off a small island called Egg Island near the western point of St. Helena, but later in the year they are also caught off Jamestown and to the east. They are always counted and sold in dozens; sometimes they bite very eagerly and are caught quickly, at others only a few may be taken in a whole night. The largest number caught by one boat during my visit was 59 dozen, the crew consisting of six men.

Genus THYNNUS.

Three kinds of albacore are constantly distinguished by the fishermen of St. Helena, as was stated by Melliss in 1875; they are called the long-fin, the bastard, and the coffrey, the first being regarded as the typical form, and the term bastard being used in the sense of variety, but the origin or meaning of the third name I was unable to discover. The majority of recent writers recognize only one species of long-finned tunny, the *Scomber germo* of Lacépède, *Thynnus alalonga* of Cuvier & Valenciennes. The revision of the Scombridæ of America and Europe by Dresslar and Fesler, Bull. U.S. Fish. Comm. 1887, only recognizes one species of long-finned tunny, which is named *Albacora alalonga*, the common tunny being placed in the same genus as *Albacora thynnus*. Jordan and Evermann, in 'Fishes of North and Middle America' 1896, adopt a somewhat different arrangement and nomenclature; they also recognize only one long-finned species but call it *Germo alalonga*, with which they consider the *Thynnus balteatus*, *pacificus* and *argentivittatus* of the 8th vol. of Cuvier and Valenciennes to be synonymous; the Tunny they make generically distinct and call it *Thunnus thynnus*. It is easy to recognize in the figures given by Cuvier and Valenciennes and by Dresslar and Fesler the form called the bastard at St. Helena; not only the length but the shape of the pectoral prove this: it reaches to the end of the anal fin or to the first finlet beyond it, and is very narrow and shaped like a scythe.

I was much interested to discover that the three forms I saw at St. Helena were described as distinct species by Lowe at Madeira so long ago as 1839 in our 'Proceedings.' The one he names *Thynnus alalonga* Cuv. & Val., is the bastard of St. Helena, its chief character being the great length of the pectorals, which are one-third of the total length of the body and reach to the end of the anal or to the first spurious finlet behind it. Another species described by Lowe as *Thynnus albacora* is the ordinary albacore or long-fin of St. Helena. He calls this a very distinct species and gives as its chief character the elongation in the vertical direction of the anterior part of the second dorsal and the anal, a feature which was very conspicuous in the specimens that I saw at St. Helena. The pectoral is described as from one-fifth to one-fourth of the total length, reaching to the middle of the second dorsal. The third species of Lowe, named by him *Thynnus obesus*, agrees exactly with the coffrey of St. Helena; it is described as differing from the others by the shorter and stouter shape and by the larger eyes, the pectorals being from one-sixth to one-fourth of the total length and reaching to the end of the second dorsal. As at St. Helena, the fishermen of Madeira distinguish the three species by separate names, *alalonga* being called 'atum avoador,' *albacora* 'atum albacora,' and *obesus* 'atum patudo.' Two of Lowe's species were entered in the British Museum Catalogue by Dr. Günther, namely *Thynnus alalonga* and *T. albacora*, but *T. obesus* is mentioned only in a footnote as a doubtful species.

It is necessary to consider whether the characters of these three forms are due to age or sex. With regard to age there can be no doubt that it is not the cause of the differences. The different characters were developed in fishes of about the same size, and both small and large specimens of the three kinds were easily distinguished. In one form—namely, the common albacore of the inhabitants of St. Helena—there are considerable changes in the course of growth; but these changes do not lead to any approximation to the other forms but rather to the greater development of the special features: in a small specimen somewhat less than 3 feet in length the second dorsal and the first ventral fins were scarcely higher than in the other two forms, while in larger specimens the great vertical elongation of these fins is very characteristic. With regard to sex it is obvious that there are not three sexes, and although I cannot say that I examined males and females of each form, I certainly saw specimens of different forms which were of the same sex, and came to the conclusion that sex had nothing to do with the matter. Moreover, sexual dimorphism is not known in the family.

All recent writers seem to have ignored the species *albacora* and *obesus* of Lowe. Dresslar and Fesler give *Thynnus albacora* Lowe as a synonym of *Thynnus alalonga*, although in their diagnosis they state that the dorsals and anals are of height equal to the length of the second dorsal; whereas Lowe specially mentions the great height of the second dorsal and anal, which in large specimens are nearly three times as high as the length of the base of the second dorsal.

The three species of Cuvier and Valenciennes—*Thynnus balteatus*, *T. pacificus*, and *T. argentivittatus*—are regarded by Dresslar and Fesler as synonyms of *alalonga*, but to me they seem to be insufficiently characterized, and *balteatus* is described only from a drawing. I therefore omit them from the synonymy.

As in many other cases, the application of the rules of nomenclature has caused great diversity of opinion on the question of the generic names of Scombridæ in general and of the tunnies in particular; scarcely two writers can be found to agree on the subject. *Thynnus*, the specific name of Linnæus, was made the generic name by Cuvier; and Lowe, as mentioned above, calls the three species here considered *T. alalonga*, *T. albacora*, and *T. obesus*. In the 'Règne Animal,' 1817, Cuvier used the name *Orcynus* for the species *alalonga*, and this has been adopted by several writers. The American writers Dresslar and Fesler have discovered that both these names are preoccupied, *Thynnus* having been used by Fabricius for a genus of butterflies, and *Orcynus* by Rafinesque in 1815 for the *Scombroides* of Lacépède. They therefore adopt the name *Albacora*, proposed by Jordan in 1889. As the names *Thynnus* and *Orcynus* have been applied to the well known tunny from the times of the ancients, it seems to me absurd on pedantic grounds of priority to allow them to be confined to a genus of butterflies or another genus of fishes, and I propose to follow Lowe in using the name *Thynnus* for these species, placing them in the same genus as the Common Tunny, which therefore becomes *Thynnus thynnus*. The generic characters are :—Body entirely covered with scales, which are larger in the anterior part and sometimes form a distinct corselet; vomer and palatines with villiform or minute teeth; teeth in jaws slender, subconical; body robust, not compressed.

It appears that only one of these three species, namely *Thynnus alalonga*, occurs to the north of Madeira. The others have never been identified on the coasts of Europe or North America, and only *alalonga* is mentioned in the King of Portugal's "Pesca do atum no Algarve en 1898," published in 1899 as the first memoir of 'Resultados das Investigações scientificas feitas a bordo do Yacht

'Amelia.'' Only *alalonga* has hitherto been recognized in the Mediterranean and on the east coast of North America. It is possible that all three species occur in the West Indies; in fact, Poey in his Enum. Pisc. Cubens. 1875 mentions *Orcynus albacora* Lowe and another species, *subulatus*, in which the length of the pectoral is contained five times in the total length to base of caudal. This *subulatus* may be identical with Lowe's *obesus*, but Poey's description is insufficient to prove it. All the three species exist in the Pacific Ocean. In Temminck and Schlegel's 'Fauna Japonica,' Pisces, published in 1850, two species are described as occurring off the coasts of Japan, *Thynnus macropterus* and *T. sibi*. The former is seen, both from the description and the figure, to be identical with *T. albacora* of Lowe and with the common albacore of St. Helena. The elongation of the second dorsal and the ventral (anal), and the yellow colour of these fins and of the finlets, are specially mentioned and well shown in the figure The corselet is stated to be still less distinct than in *T. sibi*. The pectorals are a little more than a fourth of the total length, and in the figure reach to the middle of the second dorsal and are broad in the proximal half. Jordan and Evermann, in 'Fishes of North and Middle America,' give this *T. macropterus* as a synonym of *Germo alalonga*. The *Thynnus sibi* of Schlegel appears to be identical with the coffrey of St. Helena, the *T. obesus* of Lowe. The characters given are:—Second dorsal and anal not elongated, first false fins united to second dorsal and anal, pectorals shorter than in *alalonga*, fins blackish, 8 free finlets above and 8 below. Schlegel suggests that this form may be the Pacific representative of *alalonga*.

In 1897 Kitahara, a Japanese naturalist, identified and figured not only the *T. sibi* and *T. macropterus* of Temminck and Schlegel, but also the *alalonga*, under the name *Orcynus germo* Lacép., and the common tunny. In the English descriptions the characters are not given in much detail, but the large size of the eye in *T. sibi* is mentioned ("eye about one-sixth in the head"), and the pectoral reaching to below the end of the first dorsal. This length of pectoral, both in description and figure, is rather less than in the coffrey of St. Helena; but the fish shows distinctly the stouter form of body which characterizes the coffrey. None of the figures, not even that of the common tunny, show a corselet. The figure of *macropterus* shows the characteristic elongation of the second dorsal and ventral, but that of *Orcynus germo* (=*alalonga*) does not show the pectoral so narrow or so curved as in the bastard of St. Helena, although it shows the characteristic length.

In 1905 Jordan and Seale mention, in a list of the fishes of Samoa (Bull. U.S. Bur. Fish. vol. xxv.), the species *alalonga* under the name *Germo germo*, and consider it synonymous with the *Thynnus sibi* of Schlegel, but distinguish *Germo macropterus* of Schlegel, mentioning its elevated second dorsal and anal and the citron-yellow colour of its finlets. On the coast of California only *alalonga* has been identified, under the name *Orcynus pacificus*, by Cooper in Proc. Cal. Acad. Nat. Sci. 1863, who, however, represents the pectoral as larger than that described by other writers, namely, half the length of the body. Thus the three species are known with certainty to occur together only at St. Helena, Madeira, and Japan; while *albacora* has been identified at Samoa. It is possible that all three occur in the intermediate tropical oceans—that is to say, in the Indian Ocean, but they have not yet been all recognized there. Only *alalonga* is mentioned in Gilchrist's 'Catalogue of Fishes of South Africa' (Marine Inv. in S. Africa, Cape Depart. Agriculture, 1902).

T. albacora is mentioned by Day among the fishes of India, and by Bleeker as occurring at Batavia.

THYNNUS ALALONGA. (Text-fig. 3.)

Orcynus alalonga Cuvier, Règne Anim. 1817.

Thynnus alalonga Cuvier & Val. Hist. Nat. Poissons, vol. viii., 1831; Lowe, Supp. to Synopsis of Fishes of Madeira, Proc. Zool. Soc. 1839; id. Trans. Zool. Soc. iii. 1849.

Germo alalonga Jordan & Evermann, Fishes of North and Middle America, Bull. U.S. National Museum, No. 47.

Albacora alalonga Dresslar & Fesler, Review of Mackerels of America and Europe, Bull. U.S. Fish. Comm. for 1887, 1889.

Orcynus germo Kitahara, Scombridæ of Japan, Journ. Fish. Bur. Tokyo, vol. vi., 1897.

Germo germo Jordan & Seale, Fishes of Samoa, Bull. U.S. Bur. Fish. vol. xxv., 1905.

Scaled all over. General appearance silvery with scarcely any yellow colour on dorsal and ventral fins, a trace of it in the middle of the dorsal finlets, none on the ventral. Second dorsal and first ventral scarcely higher than first dorsal, with no yellow colour. Pectoral very long, narrow, pointed, scythe-shaped, reaching to posterior border of first ventral fin and fitting into depression on

Text-fig. 3.

Thynnus alalonga, 3 ft. 2½ in. long. From a photograph by the Author.

side of body. Nine dorsal finlets, first two rudimentary; 8 ventral, first one small. Length of specimen examined 3 ft. 2½ ins.

Called the bastard at St. Helena, where it seems less common than *T. albacora*.

THYNNUS ALBACORA. (Text-fig. 4.)

Thynnus albacora Lowe, Proc. Zool. Soc. 1839; id. Trans. Zool. Soc. iii. 1849; Günther, B. M. Cat. Fishes, ii. p. 365.

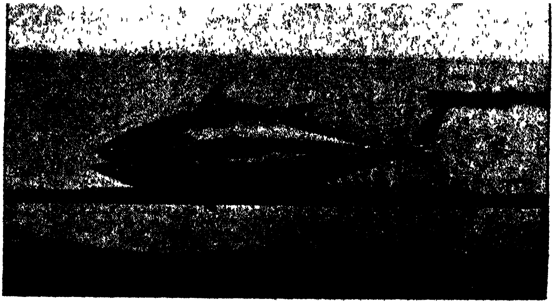
Thynnus macropterus Temminck & Schlegel, Fauna Japonica, 1850.

Orcynus macropterus Kitahara, Journ. Fish. Bur. Tokyo, vol. vi. no. 1, 1897.

Germo macropterus Jordan & Seale, Fishes of Samoa, Bull. U.S. Bur. Fish. vol. xxv., 1905.

Pectorals reaching to the middle of the second dorsal but not to the beginning of the ventral, about one-fourth of the total length; second dorsal and ventral much elevated, pointed, falciform; distal and posterior parts of these fins strongly tinted with bright yellow colour. Dorsal and ventral finlets also *coloured yellow, without black border or only a very narrow line of black. The specimen* which I examined had 8 finlets above and 9 below; Kitahara gives 9 dorsal and 9 ventral, but his figure shows the first dorsal small and united to the second dorsal fin. I saw many specimens, but the one which I obtained for special examination was small and young, less than 3 feet in length, and had the second dorsal and first ventral scarcely more produced than in the other species; the colour of these fins and of the finlets and the length and shape of the pectoral were sufficient, however, to identify it.

Text-fig. 4.



Thynnus albacora, young specimen, nearly 3 feet long. From a photograph by the Author.

This species is the commonest of the three at St. Helena, and it reaches a large size. I bought in the island a photograph of the largest specimen landed in recent years, but could not get its exact dimensions and weight; judging from the photograph, it was between 7 and 8 feet in length, and I was told that it weighed about 400 lbs.

This species is regarded at St. Helena as the typical or common form and has no special name, but is merely called the long-fin or the albacore. It is mentioned by Day as occurring in Indian waters, and by Bleeker (Verh. Batav. Genootsch. xxiv. 1852), who saw one specimen in the market of Batavia.

Lowe suggests that the figure given by Pennant (Brit. Zool. ed. 1, iii. pl. lii.), which according to the text is taken from a specimen 7 ft. 10 ins. long, weighing 460 lbs., taken at Inveraray, really represents a specimen of his *T. albacora*, not of the common tunny. The figure represents the prolonged second dorsal and ventral fins, and the description states that these fins were high and falciform and that the finlets were of a rich yellow colour. This description and figure could scarcely apply to any other species, although this species does not appear to have been recognized in the British Islands subsequently. Lowe also refers to Sloane's albacore, mentioned and figured in his 'History of Jamaica' published in 1727 (Tab. i. fig. 3), as possibly representing this species. This figure also shows the prolonged and pointed second dorsal and ventral. Cuvier and Valenciennes (vol. viii. p. 148, 1831) describe this fish, not from specimens, but from Sloane's description and figure, and consider it to be an Auxis, on account of the interval between the first and second dorsal, heading their discussion with the names "L'Auxide de Sloane. *Scomber Sloanei* nob." This should evidently be *Auxis sloanei* nob., as they have already defined the genus *Auxis* for fishes of this character. But in all probability the first dorsal is not correctly represented in Sloane's figure, as the posterior spines are short and can only be seen by forcibly raising them from the deep dorsal groove which receives this fin when it is depressed. These spines may well have been overlooked by an observer in those early days of ichthyology. Dresslar and Fesler consider *Scomber sloanei* Cuv. & Val. as a synonym of the common tunny. These imperfect records are interesting historically, and because they suggest that the species occurs in the West Indies, and that a specimen has occurred in Scotland; but as Lowe was the first accurately to distinguish the species from others, his name must be accepted.

In the published form of Günther's British Museum Catalogue the description of this species is merely copied from Lowe, and no specimens are recorded; but in the MS. additions in the interleaved copy used in the Fish Department there are now three specimens registered as follows:—

a.	Adult, stuffed.	Madeira.
b.	" "	Muscat.
c.	Skeleton.	Muscat.

It is evident, therefore, that the species occurs at the mouth of the Persian Gulf. Another stuffed specimen is exhibited in the public Fish Gallery of the Museum, but the origin of this specimen is unknown.

THYNNUS OBESUS. (Text-fig. 5.)

Thynnus obesus Lowe, Fishes of Madeira, Proc. Zool. Soc. 1839; id. Trans. Zool. Soc. iii. 1849.

Thynnus sibi Temminck & Schlegel, Fauna Japonica, 1850.

Orcynus sibi Kitahara, Scombridæ of Japan, Journ. Fish. Bur. Tokyo, 1897.

This species is distinguished in the first place by its stouter, more robust shape and by its larger eye; the stouter form is evident also in the figure of *Orcynus sibi* given by Kitahara. The first dorsal in the specimen which I examined had 13 rays; finlets, 9 dorsal, the first small but not rudimentary, and 9 ventral, all with distinct yellow colour in the middle and broad black border. Second dorsal and first ventral also with some black at edges, but little or no yellow, not prolonged as in *albacora*. Pectorals reaching to past the beginning of the second dorsal but not to the beginning of the first ventral; pointed and triangular, broad at base. According to Kitahara the pectoral reaches to the end of the first dorsal or to the origin of the second, and is therefore rather shorter than in my specimen, which was 3 ft. 9½ ins. in length. Kitahara says it grows in Japan as large as the common tunny, that is, 6 or 7 feet in length; but I do not know whether this is the case at St. Helena. Known to the St. Helena fishermen as the coffrey.

Text-fig. 5.

Thynnus obesus. 3 ft. 9½ in. long. From a photograph by the Author

GYMNOSARDA ALLETERATA.

Scomber alleteratus Rafinesque, Caratteri alcuni Generi, &c., 1810.

Thynnus thunnina Cuv. & Val. viii., 1831; Temminck &

Schlegel, Fauna Japonica, 1850; Günther, B. M. Cat. Fishes, ii. 1860; Bleeker, Verh. Batav. Genootsch. Makr. xxiv., 1852.

Scomber quadripunctatus Geoffroy St.-Hilaire, Descr. Egypte, Poissons, 1827.

Euthynnus alliteratus Jordan & Gilbert, Syn. Fish. N. Amer., Bull. U.S. Nat. Mus. No. 16, 1882.

Gymnosarda alleterata Dresslar & Fesler, Bull. U.S. Fish. Comm. vol. vii., 1889.

Thynnus thunnina Kitahara, Journ. Fish. Bur. Tokyo, 1897.

It is evidently desirable to separate the bonitos, in which the body is entirely scaleless behind the corselet, from the tunnies; and for this genus I have adopted the name *Gymnosarda*, originally proposed by Gill in 1862 and used by Dresslar and Fesler and by Jordan and Evermann.

The distribution of this species seems to be very similar to that of the three species of albacore. It is mentioned by Kitahara under the name *Thynnus thunnina* as being not very common on the coasts of Japan. Also by Day in his 'Fishes of India'; he says it is often seen in the markets of Bombay in the cold weather. It is stated by Bleeker to occur in the Malay Archipelago; but it is absent from Gilchrist's South African list. It has long been known to occur in the Mediterranean.

I saw only one specimen at St. Helena, and this was entangled in a mackerel-net of English make with which I was experimenting for the capture of *Scomber colias*. The specimen was 2 ft. 6¼ ins. long, a female. Bonitos of this species are occasionally taken by the albacore-boats of the island, but they are not much esteemed as food, and are of far less value than albacore.

THYRSITES PROMETHEUS.

Thyrsites prometheus Günther, B. M. Cat. Fishes, ii. p. 351; Melliss.

Prometheus atlanticus Lowe, Proc. Zool. Soc. 1839, p. 78; id. Trans. Zool. Soc. ii. p. 181.

Gempylus prometheus Webb & Berthelot, Iles Canar., Poiss. p. 51, pl. xi.

Night Serpent, Melliss.

D. 17; V. 19, not 18/21 as in Günther. Spines representing pelvic fins very minute. I obtained only one specimen of this fish, which was caught on a mackerel-line at night off Egg Island; it was 13 inches long to the end of the middle caudal rays, 14 inches to the end of the lobes of the forked tail. It is of a uniform black colour, and is not eaten. It occurs both in the Atlantic and the Pacific, namely at Madeira, the Bermudas, off the coasts of Japan, and very young specimens taken by the 'Challenger' north of the Sandwich Islands have been identified as of this species.

PLATOPHRYS PODAS.

Pleuronectes podas De la Roche, Ann. Mus. xiii. p. 354, 1809.

Pleuronectes mancus Risso, Ichth. Nice, p. 317, 1810.

Rhombus rhomboides Bonaparte, Fauna Italica, iii. Pesci, 1832–41 (male).

Rhombus podas, ibid. (female).

Rhomboidichthys mancus Günther, B. M. Cat. Fishes, iv. p. 432, 1862 (male).

Rhomboidichthys podas, ibid. (female).

Bothus podas Steindachner, Ichth. Bericht. Sechste Fortsetzung, S.B. Akad. Wien, 1868.

Rhombus maderensis Lowe, Proc. Zool. Soc. 1833, p. 143.

Rhombus serratus Valenciennes in Webb & Berthelot, Iles Canar., Poissons, p. 82, 1835–50.

Platophrys podas Jordan & Goss, Flounders & Soles Amer. & Europe, Bull. U.S. Fish. Comm. for 1886 (1889).

Rhomboidichthys sp., Melliss.

The specimens which I brought back from St. Helena are 8 in number, 4 large males, 2 large females, and 2 smaller females; the largest male is 8⅜ ins. long, the largest female 8⅝ ins.; the two smaller females are 6½ and 6⅛ ins. respectively. In the males there is a spine on the anterior end of the maxilla and another on the antero-superior angle of the lower orbit, also one on the antero-inferior angle of the upper orbit, but this last is less prominent. As in other cases of sexual dimorphism the male characters are slightly developed in the largest females; in this case the interorbital space is greater than the diameter of the orbit but much less than in the adult male. The colour of the St. Helena specimens is very dark, almost black, marked with ocelli consisting of rings of minute bluish-white spots; no dark spot on the lateral line is visible. In the British Museum is a specimen from Ascension, 8¼ ins. long, much lighter in colour than my specimens and with much more conspicuous ocelli; it is labelled *R. ocellatus* but is certainly of the same species as mine, the true *ocellatus* of Agassiz having the pectoral elongated in the male, while in *podas* it is not elongated. I have no doubt that the various species of the genus described under different names from the Mediterranean, Madeira, and the Canaries are all one species and that the species found at St. Helena and Ascension is the same, but in some of these localities there appear to be local peculiarities which must be considered. In the British Museum specimens from St. Helena collected by Melliss are labelled by Dr. Günther *R. mancus* var. The dark colour of the St. Helena specimens is evidently due to the dark volcanic material of which the sea-bottom consists, and is probably not permanent since we know that flat-fishes change their colour according to the ground on which they live; this darkness conceals the characteristic black mark on the lateral line, which cannot therefore be said to be absent. Mediterranean examples in the British Museum are old and not in very good condition, but those from St. Helena agree closely with the figures given of Mediterranean specimens by Bonaparte in his 'Fauna Italica.' The St. Helena examples seem, however, to reach a larger size; Bonaparte states that the female is a little more than 5 ins. in length, the male about 6 ins.; but Carus in his 'Fauna Mediterranea' gives the maximum length as 22 cm. or 8⅘ ins., which is as great as at St. Helena. Specimens from Madeira in the British Museum seem more different from mine. Two of the three seem to have been allowed to dry at some time, but the third is well preserved; it is a male only 6⅛ ins. long and yet with the sexual characters fully developed, and it seems, therefore, that the species does not reach so large a size at Madeira. In these specimens also the anterior profile of the head is more vertical than in mine, and the top of the head is nearly level with the highest point of the dorsal edge of the body, while in mine it is distinctly lower than the latter. In these Madeira specimens the upper eye forms a projecting angle in the profile, which is much less the case in mine. Steindachner states that the colour and markings vary considerably in examples from different localities: in specimens from Teneriffe the ground-colour is very dark violet-brown, the large bluish spots usually absent, and there are instead numerous small blue specks. Valenciennes describes his *R. serratus* of the Canary Isles as "sans aucune tache" and not the same as the *maderensis* of Lowe. He gives its length as 14 or 15 cm. or up to 6 inches.

The species is not uncommon at St. Helena, but at the same time not very abundant. I caught them in a small otter-trawl worked from a steam-launch. On March 15th, I obtained six in one haul and one in another at about 30 fathoms, from Jamestown westwards to Lemon Valley: the trawl brought up no stones or gravel but quantities of the coarse sponge mentioned elsewhere in this paper. On March 19th, I caught about a dozen specimens in 15 fathoms in Prosperous Bay on the windward side of the island, and a single specimen in a haul in 10 fathoms. So far as I could ascertain a trawl had never before been used at St. Helena and so many specimens of this fish, locally known as the flounder, had never before been seen; in fact many of the residents had never seen it before.

This species is not known to occur outside the Atlantic, but it is possible that the *R. spinosus* of Poey found at Cuba is the same species. One of the characters of *P. podas* is the presence of minute spines at the bases of the dorsal and ventral fins, formerly described as belonging to scales, but now known to be projections of the tips of the interspinous bones; these occur in Poey's species but in no others. Most of the other species have the rays of the pectoral of the upper side elongated in the male, but this character is wanting in *podas*.

SCORPÆNA SCROFINA.

Scorpæna scrofina Cuv. & Val. ix. p. 465; Melliss.

Mail or Rock Gurnard, Melliss.

D. XI; I. 10; V. III, 6; P. 21; Plv. 6; Sc. 46; Br. 7.

Height of body 3½ in total length. Length of head just over 3 in total length. Snout from front of orbit to end of upper jaw $\frac{1}{3}$ the length of the head. Width between orbits $\frac{1}{6}$ length of head. Cheeks and upper part of operculum with rudimentary scales. Teeth on vomer and palatines. Most of the scales in the dorsal and lateral regions fringed with a thin flap of skin; no orbital tentacles.

My first specimens of this species were obtained in the fish-market, to which they are brought regularly; afterwards I caught four specimens in a small trammel set in about 4 fathoms of water off Banks' Valley, and three in a haul of the small otter-trawl in about 30 fathoms from Jamestown to Lemon Valley. I also caught two or three specimens in Prosperous Bay on the windward side of the island at a depth of about 10 fathoms.

This species was described by Cuvier and Valenciennes from specimens obtained from Brazil, and no specimens were in the British Museum collection until Melliss sent some from St. Helena.

SALARIAS TEXTILIS.

Salarias textilis (Quoy & Gaimard), Cuv. & Val. xi. p. 307; Günther, B. M. Cat. Fishes, iii. p. 248.

D. XII, 15; V. I, 6.

I obtained a single small specimen 2½ ins. long from a rock-pool below the wharf at Jamestown. It agrees with Gunther's description. The first dorsal is almost completely separated from the second by a deep notch. There is a tentacle with several filaments above the orbit, another at the nostril, and a small one on the neck on each side of the dorsal median line; 12 transverse brown bands on the sides and others on the tail, oblique brown bands on the dorsal fin, a square spot above the pectoral representing the first transverse stripe; second dorsal much higher than the first and than the ventral.

This species was previously known only from Ascension; two specimens from that island presented by Dr. McCloy are in the British Museum.

BALISTES BUNIVA.

Balistes ringens Osbeck, Voy. Chin. ii. p. 93 (not Linn.).
Baliste buniva Lacép. v. p. 669, pl. 21, fig. 1.
Balistes buniva Günther, B. M. Cat. Fishes, viii. p. 228; Melliss.
File-fish, Melliss.

I brought two specimens of this species home with me, one from St. Helena and one from Ascension; the former was 9 ins. long, the other 10 ins. They agree with the description given in Günther's Catalogue except the following details: the white line along the bases of the dorsal and ventral fins is blue in the fresh fish; in the larger specimen there is a black intra-marginal line edged externally by a thin white or blue line along the border of the caudal fin, and the dorsal and ventral extremities of this fin are slightly prolonged, the posterior edge of the fin being concave;

in the smaller specimen there is no intra-marginal line and the edge of the fin is straight, the corners not being prolonged. On examining the generative organs I found that the smaller specimen was a female and the larger a male, the organs in both being large and well developed. The slight differences described would thus appear to be sexual, but in *Balistes vetula*, of which I brought a specimen 14¼ ins. long from Ascension, the dorsal and ventral caudal rays and also the anterior rays of the second dorsal are much prolonged, and the specimen is female. It is of course not unusual to find a character confined to the male in one species present in both sexes in another.

Balistes buniva is not very common at St. Helena; I obtained one specimen from the fishermen, and another was caught on a ground-line off George Island on the windward side of the main island. At Ascension it is very abundant; on the outward voyage when the ship anchored off Georgetown shoals of these fishes came alongside to feed on pieces of orange-peel and other fragments thrown overboard. I went down the boat ladder with some pieces of biscuit to try to catch one, and when I had no more biscuit simply moved my fingers about at the surface of the water; a number of the fishes crowded round my hand and I was able to seize one and lift it into the boat. On the return voyage some were caught by passengers with hook and line, and on one line let down to a greater depth was caught the specimen of *Balistes vetula* mentioned above, the bait used being pieces of raw beef. Both these species have a thin patch of skin covered by angular scutes instead of scales just above and behind the base of the pectoral fin; beneath this membrane is an air-cavity and the whole forms a drum by which a sound is produced. I heard this sound when I held a specimen of either species in the hand, and noticed that when it was produced the pectoral was moved rapidly to and fro over the membrane; when I held the pectoral motionless in a forward position the fish was unable to produce the sound. Möbius (SB. d. Berlin. Akad. der Wissenschaften, 1889, p. 999) attributes the sound in *B. aculeatus* of Mauritius to stridulation between the postclavicle and a longitudinally grooved area on the inner surface of each cleithrum; both these bones he states are in intimate relation with the air-bladder and a portion of the lateral walls of the bladder is in contact with the skin, which visibly shares in the vibratory movement of the bladder when the sounds are emitted. I cannot disprove the truth of this explanation, but it seemed to me as though the pectoral actually set the membrane of the drum in vibration, and in any case I satisfied myself that the movement of the pectoral is necessary for the production of the sound. *Balistes vetula*, but not *B. buniva*, also made another quite distinct sound of a grating character apparently from the inside of its mouth, perhaps by the rubbing together of pharyngeal teeth, but I was not able to trace the origin of this sound more precisely. In both species the first dorsal spine is firmly locked when erected and can only be depressed by first pushing back the slender second spine. (See Otto Thilo, Journ. Anat. and Phys. vol. xxxv. p. 207.)

This species is widely distributed, occurring in the West Indies (Jamaica), Zanzibar, the coast of China, Sandwich Islands, St. Paul's Rocks, and Ceylon.

OSTRACION QUADRICORNIS, var. NOTACANTHUS.

Ostracion quadricornis Linn. Syst. Nat. i. p. 409.
Ostracion lister Lacép. i. p. 468, pl. 23. fig. 2.
Ostracion notacanthus Bleek. Ned. Tijds. Dierk. ii. p. 298, fig.
Ostracion quadricornis Bleek. Atl. Ichth. v. p. 32.

Melliss states that this fish is not very common at St. Helena, but I found it quite common although not so abundant as the cunning-fish, with which it was usually to be seen swimming about the landing steps of the wharf. I caught specimens with a rod and line using a small hook and mackerel as bait. It was of a beautiful blue colour when first caught, each hexagonal scute having a spot of darker blue in the centre. All that I saw had the spine on the dorsal edge which distinguishes the variety *notacanthus*, which is peculiar to St. Helena.

The species is confined to tropical parts of the Atlantic, and occurs at the Bermudas, West Indies, coasts of Brazil, Ascension, and West Africa. A specimen from Rio Janeiro in the Museum has no dorsal spine; Günther remarks that specimens from the West Indies often have an indication of this spine. In all cases the spines are outgrowths of the centres of single scales, although the dorsal spine and the two ventral spines suggest the idea that they are the vestiges of the first dorsal and the pelvic fins.

Bleeker considers the *notacanthus* of St. Helena a distinct species, although he says that the dorsal spine exists sometimes in *quadricornis*; but he says there are other differences: the back in *quadricornis* is more compressed and more elevated, the profile more perpendicular, the eyes smaller, the head smaller, the scutes of the side more numerous, and a spine at the end of the carapace above the caudal peduncle. A very good figure of the St. Helena variety is given by Bleeker. The colours are apparently from a spirit specimen, as I find the characteristic blue colour which I saw in the fresh specimens at St. Helena vanishes after they have been in spirit.

Tate Regan (Proc. Zool. Soc. 1902, ii. p. 291) adopts *Lactophrys* Swainson (Lardner's Cyclopædia, Fishes, vol. ii. 1839, p. 324) for those with only three ridges, and makes *Ostracion* four- or five-sided. But the original *Ostracion* of Linnæus was three-sided.

TETRODON CUTANEUS.

Tetrodon cutaneus Günther, B. M. Cat. Fishes, viii. p. 287 (1868).

This species was named by Günther, and has been found only at St. Helena. It is well known to the fishermen of the island under the name of 'bottle-fish.' I obtained only one specimen, which I caught myself when out in an albacore-boat moored in about 90 fathoms off the south-west point of the island. I was fishing with a bottom line with two rather small hooks attached to the sinker; the hooks were baited with mackerel. Feeling a bite, I hauled up and found the line cut and one of the hooks gone: the men said this was done by a bottle-fish, and when I put the line down again I caught one. When it came to the surface it was almost spherical, the abdomen being distended not with air but with water. As the fish lay in the bottom of the boat it discharged the water in gushes from its mouth and gill-apertures until it was completely collapsed, the skin of the abdomen becoming flaccid and showing loose longitudinal folds.

Günther (Study of Fishes, 1880, p. 687), after remarking that when a globe-fish is inflated with air its skin is stretched to its utmost extent and the spines protrude and form a defensive armour, proceeds as follows:- "However, it is probable that the spines are a protection not only when the fish is on the surface and able to take in air, but also when it is under water. Some Diodonts at any rate are able to erect the spines about the head by means of cutaneous muscles; and perhaps all fill their stomach with water instead of air for the same purpose and with the same effect." It is not clear whether this means that some are known to do so with certainty or that it is only a probability in every case. I have shown that it is at least true for *Tetrodon cutaneus*, and in this species the effect is not to erect spines, for there are none. There is no evidence that this species ever inflates itself with air; I never heard of it being taken except at the bottom in deep water.

CRUSTACEA*.

There is a fishery for Crustaceans at St. Helena, the edible forms being the crayfish, *Panulirus guttatus*, known as the 'long-legs,' and the Scyllarid *Scyllarus latus*, which is called the 'stump.' The latter is caught in traps of elongated cylindrical shape made of strips of bamboo fastened together by iron hoops, each end of the trap being fitted with a reentrant cone open at the apex; the trap is thus similar in principle to one type of lobster-pot used in Britain, especially on the east coast. Only one boat was engaged in this fishing during my visit, and I went out for a night's fishing in her. The traps, which the fishermen call nets although no net is used in their construction, were put down in about 15 fathoms of water off Sugar-loaf Point. They were weighted with iron bars and baited with albacore-heads. Each trap was sunk separately and the line attached to it was buoyed first with a bamboo spar and at the end of the line with an empty cubical paraffin can. On the occasion to which I refer we put down four or five traps, and when they were hauled in the morning each contained four or five 'stumps,' the usual price for which is 3d. each; they are used as food and also as bait for inshore fishing, this bait being for some kinds of fishes, such as silver-fish and old-wives, much more effective than the flesh of mackerel or other fishes. Some hermit-crabs were also caught in the traps, but no long-legs, as these creatures seldom or never enter the traps but are occasionally caught on fishing lines; in the trammel which I shot on the same occasion, besides the fishes which are mentioned elsewhere in this paper, I caught one large specimen of *Panulirus* but no stumps.

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* Species identified by Dr. W. T. Calman, F.Z.S.

Family PALINURIDÆ.

PANULIRUS GUTTATUS.

Palinurus guttatus Latr. Ann. du Muséum, iii. p. 393.

Panulirus guttatus Spence Bate, Voy. Challenger, Macrura, p. 78, pl. X*a*; Benedict, Proc. U.S. Nat. Mus. vol. xvi. p. 540, 1893; Bouvier, Bull. Mus. Océan. Monaco, no. 29, p. 5, 1905.

This species is mentioned in Melliss' book as the long-legs and *Palinurus* sp. It has a wide distribution in the Atlantic, occurring on the American coast, on the African coast at the Cape Verde Islands, Liberia, etc. The 'Challenger' specimens described as a variety by Spence Bate were taken at St. Paul's Rocks. It has not been identified at St. Helena before.

Family SCYLLARIDÆ.

SCYLLARUS LATUS.

Scyllarus latus Latr. Hist. Nat. Crust. et Insectes, vol. vi. p. 182.

Recorded by Melliss under the above specific name on the authority of Spence Bate and the local name 'stump,' but this record seems to have been overlooked by carcinologists. It occurs also in the Mediterranean and at the Canaries (Ortmann, Zool. Jahrb., Abth. Syst. x. p. 269, 1897).

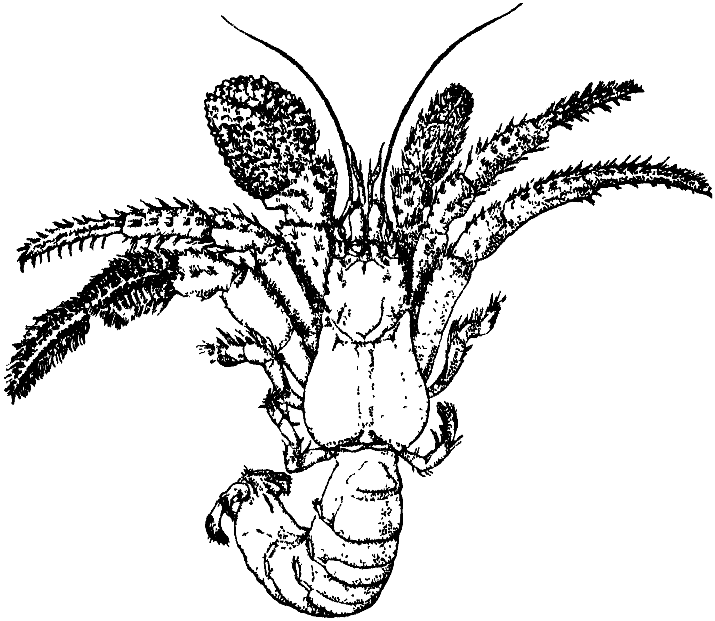
Family PAGURIDÆ.

PAGURUS IMPERATOR. (Text-fig. 6.)

Pagurus imperator Miers, Ann. Mag. Nat. Hist. (5) viii. p. 275, 1881.

This species was hitherto known only from the two type specimens in the British Museum described by Miers, both from St. Helena, one presented by H. E. Dresser, Esq., the other by Melliss. I obtained and brought back a number of specimens caught in the traps set for 'stumps.' They were inhabiting shells of *Cassis testiculus*, *Bursa cœlata*, *Septa nodifera*, and *Eugyrina* *gigantea.* I was at first struck with the narrowness of the shell opening in the *Cassis* and wondered how the crab could protrude its head through it; I found that the anterior part of the crab was much flattened, and this seemed to be an adaptation to the narrow opening of the shell; but the species occurs also in the other shells mentioned which have large rounded openings. The species is common enough at St. Helena, but has not been found anywhere else, and has not previously been figured. Melliss mentions only one hermit-crab in his book on the island under the name *Pagurus bernhardus*, a species which certainly does not occur there.

Text-fig. 6.



Pagurus imperator.

PAGURUS ARROSOR.

Cancer arrosor Herbst, Krabben und Krebse, ii. Supp. 1794, p. 170, pl. xliii. fig. 1.

Pagurus striatus Latr. Hist. Nat. Crust. et Insectes, v. p. 163.

Pagurus arrosor A. Milne-Edwards & Bouvier, Exp. Travailleur & Talisman, Crust. Decap. pt. i. p. 178, 1900; Alcock, Cat. Crust. Indian Mus. pt. ii. fasc. i. Pagurides, p. 168, 1905.

This species, in marked contrast to the preceding, has an almost world-wide distribution, having been recorded from the Mediterranean, Cadiz, Madeira, Cape Verde Islands, Senegambia, West Indies, Brazil, Philippines, Japan, and S.E. Australia. It was taken by me with the other species at St. Helena inhabiting *Septa nodifera* and other shells.

Family DROMIIDÆ.

DROMIA VULGARIS.

Dromia vulgaris H. Milne-Edwards, Hist. Nat. des Crust. ii. p. 173, pl. xxi. figs. 5–8; A. Milne-Edwards & Bouvier, Exp. Travailleur et Talisman, Crust. Decap. pt. i. p. 17; Melliss, p. 203.

I obtained one specimen of this species but am not quite sure how it was caught, whether in the trawl or the stump-traps, but believe it was by the former. Its distribution is similar to that of *Panulirus guttatus*, namely, Mediterranean, Senegal, Cape Verde Islands, Florida, W. Indies. It has also been taken on the south coast of England. In recording this species from Senegal and the Cape Verdes, Milne-Edwards and Bouvier state that it had not previously been taken so far south, overlooking the fact that it had been recorded at St. Helena by Melliss.

Family GRAPSIDÆ.

GRAPSUS GRAPSUS Linn.

This little black crab, mentioned by Melliss as the common Black Crab, is very abundant and resembles in colour the volcanic rocks over which it runs, living more out of the water than in it. It seems to be endowed with almost supernatural cunning and intelligence, numbers collecting to feed on a piece of fish or offal in a few minutes where none were previously visible and disappearing with equal celerity when one approaches. The boys have a curious method of catching them by dangling a stone attached to a string beneath one, and so driving it up to the top of the quay; in this case the crab seems to be more afraid of the stone close below it than of the human enemy above, though it often suddenly lets go altogether and drops into the water. Its distribution is circumtropical.

PLAGUSIA DEPRESSA Herbst.

This crab is less common than the preceding and lives about the edge of the water; it is much larger than the *Grapsus* and of a reddish colour, a fact which seems to show that the protective resemblance of the other is accidental. This seems to be the species mentioned by Melliss (p. 206) as locally known by the names Purple Rock Crab and Peeling Crab. Like the *Grapsus*, it is found all round the world in the tropics.

MOLLUSCA *.

Class GASTROPODA.

Order **Pectinibranchia**.

LOTORIIDÆ.

BURSA CÆLATA Broderip.

Ranella cœlata E. A. Smith, Marine Mollusca of St. Helena, P. Z. S. 1890, p. 268; Melliss, p. 124.

This species occurs at Ascension and is common on the coast of Panama. I presume this means the Pacific coast of Panama, as Mr. Smith remarks in the paper quoted above that it is extremely remarkable that it should occur at St. Helena. This and the following three species are represented in my collection only by shells inhabited by *Pagurus imperator*.

EUGYRINA GIGANTEA.

Ranella gigantea Lamarck; Tryon, Manual of Conchology, vol. iii. p. 42.

According to Mr. Smith this has not been previously recorded outside the Mediterranean.

SEPTA NODIFERA.

Triton nodiferus Lamarck.

Mr. Smith recorded *Triton tritonis* from St. Helena in his P. Z. S. paper above quoted, but from a single specimen in a very worn and broken condition. He thinks it was probably this species, which has a very wide distribution, extending from the Mediterranean to Natal in the Atlantic and from Japan to New Zealand in the Pacific. Melliss does not mention this species, but includes two others of this genus, viz. *Triton variegatus* Lamarck, and *T. olearium* Linn.

Family CASSIDIDÆ.

CASSIS TESTICULUS.

Cassidea testiculus Melliss, p. 124.

Cassis testiculus var., E. A. Smith, Marine Mollusca of St. Helena, P. Z. S. 1890, p. 257.

The typical form of this species occurs in the West Indies and on the West African coast. The St. Helena form is stated in Mr. Smith's paper to be the *C. crumena* of Bruguière, but he does not consider this to be a distinct species.

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* Species identified by E. A. Smith, I.S.O., F.Z.S.

Order **Opisthobranchia.**

UMBRACULUM MEDITERRANEUM.

Umbrella mediterraneum Lamarck; E. A. Smith, Marine Mollusca of St. Helena, P. Z. S. 1890, p. 299.

This large opisthobranch is common in the Mediterranean, and occurs also at Madeira and the Cape Verde Islands. It is not mentioned by Melliss, but was first recorded from St. Helena by E. A. Smith. I obtained a single specimen in the trawl at about 30 fathoms to the west of Jamestown; it was alive and adult.

Class CEPHALOPODA.

OCTOPUS OCCIDENTALIS.

Octopus vulgaris var. *americanus* d'Orbigny, Moll. Cuba, p. 14, tab. i.

Octopus occidentalis Steenstr. MS., Hoyle, 'Challenger' Report, xvi. p. 77, 1886.

This is doubtless the species mentioned by Melliss as *Octopus* sp. I obtained one small specimen which was brought to me by boys with some crabs from the shore rocks. It has not been identified at St. Helena before, but the 'Challenger' obtained one specimen at Ascension. It occurs at Cuba, and was found by Alex. Agassiz in the Pacific at the Galapagos Islands. My specimen was identified by Mr. W. E. Hoyle, F.Z.S., Director of the National Museum of Wales, Cardiff.

ECHINODERMATA *.

Class ECHINOIDEA.

CIDARIS TRIBULOIDES.

Cidarites tribuloides Lamarck.

Cidaris tribuloides Blainville, Zooph., Dict. Sci. Nat. 1830.

I caught several specimens of *Cidaris* in the trawl at 30 fathoms to the west of Jamestown, and all that I brought home were identified by Mr. Jeffrey Bell as of this species. It is not mentioned by Melliss, who says the thick-spined sea-egg of the island is *C. metularia* Lamarck. This is not correct, *C. metularia* being the Pacific species, extending from the Sandwich Islands to the Cape of Good Hope. *C. tribuloides* occurs also at Cape de Verde, on the west coast of Africa at Cape Palmas, at Florida, and on the coast of Brazil.

TRIPNEUSTES VENTRICOSUS.

Tripneustes ventricosus L. Agassiz, Mon. Echin. Scut. 1841.

Hipponoë esculenta A. Agassiz, Revision Echini, 1872–74.

This species is not mentioned by Melliss; I am not quite sure of the exact locality where I obtained it, but think it was caught in the trammel in 4 fathoms, off Banks' Valley, to the east of Jamestown. It is common in the West Indies.

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* Species identified by F. Jeffrey Bell, M.A., F.Z.S.

ECHINOMETRA SUBANGULARIS.

Cidaris subangularis Leske, 1778.

Echinometra subangularis Desmoulins, Actes Soc. Linn. Bordeaux, 1837.

Echinometra acufera Blainville, 1834; Melliss.

This is the species which is mentioned by Melliss under the name *E. acufera* Blainville. He refers to its abundance and to the fact that it lives in holes bored by itself in the solid basaltic rock. The rocks along the shores are everywhere studded with the holes inhabited by this urchin, which is of a black colour like the rock itself, and the animal is so firmly attached in its hole that it is difficult to dislodge it. A large number of sea-urchins are known to have this power and habit of excavating cavities in hard rock in which they dwell. In the Natural History Museum is a fine photograph of limestone rocks full of such holes inhabited by *Strongylocentrotus lividus*, at Bundoran, South Donegal, in Ireland. It is held that the boring is effected by the action of the animal's teeth and spines, and it seems that the animal never quits its hole even to feed. Apparently the sea-urchin obtains enough nourishment from the organic substances which are washed into its cavity. Simroth gives a good account of the habits of the boring form *Toxopneustes lividus*, apparently a synonym of *Strongylocentrotus lividus*, in the Azores. Möbius states that at Mauritius the holes of two boring species are narrower at the apertures than in the interior, so that it is impossible for the animal to quit the cavity. At St. Helena, and in some other cases, the cavities are only a little deeper than the diameter of the animal; but at Croisic and Douarnenez, on the coast of France, according to Caillaud, the holes are 30 to 50 cm. deep. The object of the habit is evidently to protect the animal against the force of the breakers by which, if exposed, it would run the risk of being killed, and on the coasts of oceanic islands like St. Helena the necessity for such protection is very obvious. (For a summary of the subject and its literature see Bronn's 'Thierreich,' Bd. ii. Abth. 3, p. 1296.)

E. subangularis occurs apparently everywhere in the tropical Atlantic, at the West Indies and Gulf of Mexico, the Bermudas, the whole coast of Brazil, the west coast of Africa, Cape de Verde Islands, and Ascension.

Class ASTEROIDEA.

LINCKIA.

Two specimens belonging to this genus were taken in the trawl at 20 fms. west of Jamestown, but according to Mr. Jeffrey Bell they are too young for specific determination.

Class CRINOIDEA.

ANTEDON CARINATA.

Comatula carinata Lamarck.

Antedon carinata Carpenter, Voyage of 'Challenger,' Report on Crinoidea, pt. ii.

This is doubtless the species mentioned by Melliss as *Comatula* sp. He says it is occasionally taken in rock pools at the West Rocks, *i. e.* to the west of the wharf at Jamestown, but that it is extremely rare. I took one specimen in my haul of the trammel off Banks' Valley, and should think it is by no means rare. It has a wide distribution, occurring in the tropical Atlantic, the Indian Ocean, and the Eastern Pacific; the localities are Mauritius, Seychelles, Ceylon, the coast of Brazil, and the coast of Chile. A specimen from St. Helena, according to Carpenter, is in the British Museum.

ANTHOZOA.

ACTINIARIA.

PHYMACTIS SANCTÆ HELENÆ.

Actinia sanctæ helenæ Lesson, Voy. Coquille, 1830, p. 74, Zoophytes, p. 74, pl. ii. fig. 1.

Phymactis sanctæ helenæ H. Milne-Edwards, Coralliaires, Tome i. p. 275.

This species is chiefly distinguished from other species of the genus by its colour, which on the outside of the column is very dark, almost black; Milne-Edwards calls it a very obscure reddish brown. This colour harmonises with that of the volcanic rocks on which it lives, adhering usually to the under side of overhanging masses. The species has been known at St. Helena since Lesson's circumnavigating voyage in 1830, and is mentioned by Melliss. Allied species occur on the coast of Brazil, at the Cape of Good Hope, and at Cape Verde.

MADREPORARIA.

MÆANDRINA (PLATYGYRA) ASCENSIONIS.

Platygyra ascensionis S. O. Ridley, Report on Collection made by Mr. T. Conry in Ascension Island, Ann. & Mag. Nat. Hist. (5) viii. 1881.

I found only one species of coral on the island. It was growing in small rounded masses of from 2 to 6 inches in diameter in rock pools at Prosperous Bay on the windward side. I was unable to detach living colonies, but found dry skeletons on the shore. This is evidently the same species that is mentioned under the name *Mæandrina* sp.? by Melliss, whose specimens were identified by Dr. Gray and Mr. Saville Kent of the British Museum. The species is evidently identical with that described by S. O. Ridley, from Ascension, but the name *Platygyra* is rejected by later writers on the Madreporaria, *e. g.* Martin Duncan, "Revision of the Madreporaria," Journ. Linn. Soc. xviii. 1885. The latter author admits only one genus, *Mœandrina* with *Cœloria* as a sub-genus; but whether the present species is to be placed in the main genus or the subgenus I have not decided. It is characteristic of the typical *Mœandrina* that the calycles are not distinct, but united into long grooves with parallel sides from which the septa project; in the species here considered the calycles are usually distinct, but in many parts, especially in larger colonies, two or three are united, so that they present a stage towards the condition which is typical of *Mœandrina*, a condition which is really due to incomplete division of the zooids.

HYDROZOA AND PORIFERA.

By R. Kirkpatrick, F.Z.S.

HYDROZOA.

Family Eudendriidæ.

Eudendrium cunninghami, sp. n. (Plate VII. figs. 1–3.)

Several specimens are growing out of the sponge *Chondrosia plebeja*. The largest example is 9 cm. in height. The growth of the colony is arborescent, with dark horn-coloured fasciculated main stems. The terminal polyp-bearing branchlets have from one to three groups of annular markings between base and summit.

The few polyps remaining on the specimens are scarcely well enough preserved to enable their characters to be determined, but 24 tentacles were counted in one instance. Nearly all the colonies are female, but one is hermaphrodite.

The special branches bearing the clusters of female gonophores arise on the upper side of branches or of polypiferous branchlets. The gonophoral branches are shorter than those bearing the nutritive polyps, and funnel-shaped, *i. e.* they broaden out distally; sometimes they are annulated throughout, sometimes only on the proximal half. The male sporosacs arise in a double row from an aborted polyp. They are stalked and monothalamic, the stalk curving round and dividing into two lateral wings.

The ovate gonophores, about 375 μ in long diameter, are in clusters of 3–8, closely adnate to each other and arranged spirally round a central axis. Each gonophore has a carina around the vertical central plane. When burst the empty sac resembles a hemispherical basket with a handle—the distal half of the carina—

arching over it, but sometimes the handle also is ruptured in the centre.

I have not been able positively to identify this form with any known species; at the same time many of the latter appear to be founded on insufficient characters. For the fasciculation or non-fasciculation of the stem may depend on the age of the colony, and the degree of annulation of the stems is usually, but not always, a variable character. The mode of growth, arrangement, and structure of the gonophores is a more important feature, but many species have been described from colonies the gonophores of which are unknown.

The nearest related species is *E. carneum* S. F. Clarke, from Chesapeake Bay (Mem. Boston Soc. N. H. iii. 1887, p. 137, pl. vii. figs. 10–17). In the North American form several groups of female sporosacs spring from a branchlet and the semicircular band does not appear to exist at the distal end. Again, the male sporosacs are spherical and polythalamic.

The genus is cosmopolitan. Numerous species occur in the Atlantic; seven are known in the British area.

The specific characters of *E. cunninghami* are as follows:— The arborescent growth, fasciculated main stem, one to three groups of annuli on the polypiferous branchlets, the short infundibuliform branches bearing the oval, carinate, sessile female gonophores, and the male sporosacs with bifid covers.

PORIFERA.

Family CHONDROSIDÆ F. E. Schulze.

CHONDROSIA PLEBEJA O. Schmidt. (Plate VII. figs. 4 8.)

Mr. Cunningham's collection includes one large complete specimen of *Chondrosia plebeja* O. Schmidt, and several fragments, some of which have been fixed in corrosive acetic mixture.

The specimens were dredged from 30 fathoms off Jamestown, St. Helena.

The original specimens, on which Schmidt founded his species in 1868, came from Algiers. Schmidt distinguished *C. plebeja* from *C. reniformis* Nardo on account of the irregularity of the surface of the former and the presence of foreign bodies on the surface and in the interior.

Schulze, in his memoir on the Chondrosidæ (1877), accepted *C. plebeja* as a species distinct from *C. reniformis*. He had not, however, seen examples of Schmidt's species. Indeed no further description of *C. plebeja* has been given since Schmidt's time. Accordingly it is interesting to meet with well-preserved material and to be able to supplement the original description.

The complete specimen, which is shaped like a large mug with a piece out of the wall, is 14·5 cm. high, 13·5 cm. in diameter across the mouth, and has walls 3·5 cm. thick. The colour in spirit is black on the surface and whitish in section, but the black colour is due to decomposition, for Mr. Cunningham reports that in life specimens are buff-coloured with faint reddish-brown patches on outstanding parts, and paler buff in section. The sponge is rather tough but yet breakable, slightly compressible but inelastic, and differing greatly in texture from the tough leathery *C. reniformis*. The surface varies in character, being smooth here and there, but mostly irregular, deeply pitted, reticulate or tuberculated, the differences being due to the amount and kind of foreign material. The numerous incurrent pores, which are all closed and barely perceptible, are scattered over the surface. They are visible, however, in thick clarified sections at the beginnings of the incurrent canals. The oscules also are scattered and flush with the surface. They occur mostly on the inner wall of the cup. They vary in diameter from 2–8 mm., and are provided with a membranous sphincter.

The ectosome forms a very thin delicate skin, very different from the tough thick cortex of *C. reniformis*. Worm tubes and root-fibres and stems of *Eudendrium* project above the surface or may be skinned over by the ectosome. These and other foreign bodies are abundant in the interior.

The Canal System.—A slightly stained, well clarified thick section presents a most striking appearance (Pl. VII. fig. 5). The fine initial incurrent canals pass in obliquely from the surface pores and meet at various angles to form larger inhalants. These systems of initial—they can hardly be called intra-cortical—canaliculi are not regularly arranged like the pore systems in *C. reniformis*, but are irregularly dendritic (fig. 4). The larger incurrent canals, as they ramify down into the sponge, are mapped out very distinctly, owing to their having a wide tubular central axis whence much finer canals radiate out at right angles. This most remarkable arrangement may be compared in appearance to the fine brushes used for cleaning test-tubes, only one must imagine the brush to branch continually, and many of the radiating bristles also. The end branches of the "bristle" canals abut on the choanosomal mass. The terminal main axes of the incurrent canals end in terminal tufts of branching "bristle" canals. It is so unusual to find innumerable very fine canals passing off at right angles from much wider canals, that at first in thin sections of the sponge I mistook the "bristle" canals for strands of connective tissue. The ends of the branching "bristle" canals form the prosodi of the flagellated chambers. These terminal canaliculi are so extremely fine and delicate as to be barely perceptible at first, for they consist of a single layer of pavement epithelium. Accordingly the canal system is diplodal (figs. 6, 7). The existence of diplodal canal systems has been denied *, but the photographs of sections of *Corticium candelabrum*, *Chondrilla nucula*, and *Oscarella lobularis* published by Schulze clearly demonstrate the presence of prosodi*. My own sections also show the prosodi and aphodi. One would expect *a priori* that in highly developed canal systems with aphodi, prosodi also would, in some cases, tend to arise. For the same development of the choanosome which would lead to the formation of minute excurrent canals lined with epithelium, would lead also to the canalisation of terminal parts of the incurrent system and to their continuity with the pores in the walls of the flagellated chambers.

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* E. Topsent, "Étude Monographique des Spongiaires de France," Archives Zool. Exp. 1896 (3) iii. p. 522.

The flagellated chambers are spheroidal or pear-shaped, and about 30 × 24 μ in their longer and shorter diameters respectively. The aphodi open either directly into an excurrent canal or join with one or more aphodi.

The excurrent canals closely surrounded by dense masses of flagellated chambers appear dark by contrast with the larger incurrent canals surrounded by the "bristle" canals and loose tissue.

From the above account it will be seen that there are six distinct systems in the total canal system of *Chondrosia plebeja*, viz.:—(1) the initial pore canals; (2) the larger incurrent canals; (3) the radiating "bristle" canals terminating in prosodi; (4) the cordon of flagellated chambers; (5) the aphodi; and (6) the larger excurrent canals terminating in oscules.

Pigment-cells occur but are not abundant; thesocytes are numerous. Along the walls of the incurrent canals are the cells of what seems to be a unicellular alga.

There appear to be five or possibly six known good species of *Chondrosia*, viz.:—

C. reniformis Nardo.
C. plebeja O. Schmidt.
C. ramsayi Lendenfeld (? *C. reniformis*).
C. debilis Thiele.
C. corticata Thiele.
C. reticulata Carter.

C. collectrix Lendenfeld is, as Topsent surmised, a synonym of *C. reticulata* Carter, of which latter species *C. spurca* Carter is also a synonym.

Distribution of *C. plebeja*:—Algiers; off Porto Santo Island facing the Atlantic coast of Morocco, 60 fathoms (*Kirkpatrick coll.*); Grand Canary, on rocks at low tide (*Topsent*); St. Helena, 30 fathoms (*Cunningham*).

Specimens from Christmas Island, which I had named *C. plebeja* (P. Z. S. Lond. 1900, p. 129), belong to *C. corticata* Thiele.

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* F. E. Schulze, "Über diplodale Spongienkammern," Sitzungsb. Akad. Wiss. Berlin, 1896, ii. p. 891.

EXPLANATION OF PLATES IV.-VII.

Plate IV.

Fig. 1. *Congromuræna mellissii* Günther.
2. *Muræna sanctæ helenæ* Günther.

Plate V.

Leirus moselii, sp. n.

Plate VI.

Pimelepterus gallveii, sp. n.

Plate VII.

Fig. 1. *Eudendrium cunninghami*, sp. n. Branchlets with polyps. × 18.
2. The same. Female sporosacs. × 18.
3. The same. Male sporosacs. × 50.
4. *Chondrosia plebeja* O. Schmidt. Surface and vertical section showing pores and pore-canals. *p*, pore; *ic*, incurrent canal. × 50.
5. The same. Thick slice parallel to and a little below surface. *ic*, incurrent canals; *ec*, excurrent canals. × 15.
6. Flagellated chamber: *pr*, prosodus; *ap*, aphodus. × 750.
7. Flagellated chambers. × 425.
8. Collar-cell. × 1000.

3. Report on the Deaths which occurred in the Zoological Gardens during 1909. By H. G. Plimmer, F.L.S., F.Z.S., Pathologist to the Society.

[Received January 18, 1910.]

On January 1, 1909, the number of animals in the Zoological Gardens was 3307, and during the year 1996 animals were admitted, making a total of 5303 for the year.

The number of deaths during the year has been 1492, that is about 28 per cent.; but if from the above total we subtract 548 animals which did not live for six months after their arrival in the Gardens—that is, roughly, the time at which we find they have got entirely used to their new environment—the percentage of deaths is reduced to 17·8, that is practically the same as the death-rate of 1908. In 1909 the total number of animals was 305 less than in 1908, and the number of deaths 245 less. The weather conditions of 1909 were not at all good, so that the percentage of deaths is really more satisfactory than in 1908.

Of the 1492 animals which died, 1171 have been examined; of the rest, 131 were killed by order or by companions, 8 were preserved entire for anatomical purposes, and 182 were too decomposed for examination.

The following Tables show the facts ascertained in outline, and following them are some notes on the most important points.

Table I. sets forth the actual causes of death in each of the three great classes of animals. Under Reptiles are included batrachians and fishes.

TABLE I.—Analysis of 1171 Deaths.

Disease.	Mammals.	Birds.	Reptiles.	Reference to Notes.
1. *Microbic and Parasitic Diseases.*				
Tuberculosis	17	70	7	1
Mycosis		48	1	2
Malaria	..	14	1	3
Filaria	2	10	3	4
Hæmogregarines	...	.	19	5
Spirillosis	..	1		
Worms	1	2	2	6
Pneumonia	43	79	64	7
Septicæmia	15	...	1	8
2. *Diseases of Respiratory Organs.*				
Pleuritis	3	...		
Empyema	2	...		
Broncho-pneumonia	51	.		9
Congestion of lungs	38	124	38	10
Bronchitis	1	..		
3. *Diseases of Heart.*				
Pericarditis	...	1		
Fatty degeneration	1	1	.	
4. *Diseases of Liver.*				
Hepatitis	1	4	.	
Fatty degeneration	..	7		11
5. *Diseases of Alimentary Tract.*				
Peritonitis	4	2		12
Gastritis	5	1	10	13
Gastric ulceration	7	...		
Gastro-enteritis	11	5	27	
Enteritis	40	181	40	
Colitis	6	.	.	
Ulcerative Colitis	4		2	
Prolapse of Rectum	1	..	.	
6. *Diseases of Urinary and Reproductive Organs.*				
Nephritis	11	8	1	14
Fibrosis of kidneys	.	4	2	
Cystic kidneys	...	..	1	15
Inflammation of oviduct	...	6	..	
7. *Diseases of the Nervous System.*				
Myelitis	2	.	..	
8. *Various.*				
Sarcoma	3			16
Malnutrition	6	6	51	17
Abscess	2	..	1	
Anæmia without ascertained cause	...	4	2	18
Injuries	7	24	1	
No cause found	4	3	4	
	288	605	278	

Table I. is made up from those diseases which actually caused death, but in more than half of the mammals and reptiles and in more than a quarter of the birds therein tabulated there were other pathological lesions which helped towards the fatal issue of the principal disease.

The following Table II. sets forth these secondary lesions; and if it be taken in conjunction with Table I., a much more accurate representation of the prevalence of disease in the Gardens will be arrived at.

TABLE II.—Other Diseases from which the Animals tabulated in Table I. were also suffering.

Diseases.	Mammals.	Birds.	Reptiles.
Tuberculosis	8	20	16
Mycosis		10	...
Malaria	.	9	2
Filaria	11	14	3
Trypanosomiasis	.	1	2
Hæmogregarines			32
Worms	9	5	40
Hydatids	3	.	
Sarcocystis	.	1	...
Pericarditis	4	2	1
Myocarditis fragmentosa	1	..	..
Dilatation of heart	1	3	1
Atheroma	2	..	.
Fatty degeneration of liver	5	30	4
Hepatitis	1	1	1
Cirrhosis of liver	2		..
Gastric ulceration	13	.	1
Gastritis	7	.	4
Enteritis (including Colitis)	17	30	12
Proctitis	1	1	1
Intussusception	3		3
Nephritis	26	6	1
Fibrous degeneration of kidneys	1	2	1
Rachitis	35	.	...

TABLE III. showing the distribution of the diseases in Table I. amongst the principal orders of Mammals.

Diseases.	Primates.	Carnivora.	Rodentia.	Ungulata.	Edentata.	Marsupialia.
Tuberculosis	7	.	5	4	...	1
Filaria	1	...			..	1
Worms	..	...	.	.	1	.
Pneumonia	10	13	8	3	2	7
Septicæmia	4	2	3	3	...	3
Pleuritis	1	1	1	1		..
Empyema		1		...	..	1
Broncho-pneumonia	21	7	5	9	3	8
Congestion of lungs	18	5	4	2	...	7
Bronchitis	1	.	.	...	...	...
Fatty heart	1	..	.	..	..	..
Hepatitis	1	...		...	...	
Peritonitis	1	...	2	...	.	1
Gastritis	2	1	...	1	...	1
Gastric ulceration	1	..	2	4	...	.
Gastro-enteritis	..	3	2	1	1	4
Enteritis	9	5	8	3	2	13
Colitis (including ulcerative)	5	3	...	...	2	..
Prolapse of rectum	...	1	...	..	..	.
Nephritis	2	4	...	1	...	4
Myelitis	1	...	1	...	...	..
Sarcoma	1	...	1	1	...	.
Malnutrition	6	..	.	...	...	.
Abscess		.	...	1	.	1
Injuries	.	...	3	2	..	2
No cause found	...	1	2	..	1	...

Tuberculosis and Mycosis have again been the cause of a large number of deaths amongst the birds; the following table shows their relative incidence in the various orders of birds.

TABLE IV.—Comparative Table of the Incidence of Tuberculosis and Mycosis in the various Orders of Birds

Orders.	Tuberculosis.	Mycosis.
Passeres	19	6
Picariæ	17	9
Psittaci	3	3
Anseres	5	5
Columbæ	13	13
Gallinæ	20	8
Striges	9	8
Laridæ	4	5
Struthiones	.	1

If this table be compared with a similar one for 1908 it will be seen that there is no one class of bird particularly liable to either of these diseases, but that their incidence depends upon accident of position or infection.

Notes on the foregoing Tables.

The following notes refer to a few points of special interest in connection with the diseases mentioned in the tables:—

1. It will be noticed that there is a very satisfactory decrease in the amount of mammalian and reptilian tubercle in the Gardens. Although there has been a decrease also amongst the birds, there has latterly been a considerable increase in the number of cases in the New Bird House, mainly due, in all probability, to overcrowding, but also in part to structural defects. The decrease in the Reptile House appears to have been coincident with the use of sand in the cages, which is constantly changed.

2. All the cases of Mycosis have been due to the *Aspergillus fumigatus*.

3. Under the term Malaria are grouped cases in which intracorpuscular parasites, belonging to either the group of Halteridium or of Proteosoma, are found in sufficient number to cause death. In the worst cases as many as 70 per cent. of the erythrocytes have been invaded.

4. In all the cases entered under Filaria in Table I. there has been a considerable disorganisation of the blood, and in six of the birds there has been a plugging of the cerebral capillaries by the embryos of the parasite. These birds have died suddenly with so-called "fits."

On reference to Table II. it will be seen that Filaria have been found in many other cases, 43 in all. Identification in most instances has not been possible, as it is only in about a quarter of the cases that the parent worms have been discovered.

In a Wallaby there were present filaria in the body-cavity and embryos in the blood; and in the body-cavity of a fœtus found attached in the pouch there was also a parent worm similar to those in the mother.

5. Hæmogregarines have been found altogether in 51 reptiles, in some for the first time. It is proposed to make these parasites the subject of a further communication to the Society. The blood destruction in the 19 cases in Table I. was enormous, as many as 75 to 80 per cent. (in one case 92 per cent.) of the erythrocytes being invaded by the parasites.

6. The deaths recorded under Worms were due to their penetration through the stomach or intestinal wall; it will be seen from Table II. that they were present in 54 other animals. A tape-worm was found in the gall-bladder of a Wallaby.

7. Pneumonia in the Mammals and Birds has been mostly of the pneumococcal variety; in 9 of the reptiles it was a traumatic inflammation due to the irritation caused by the presence of ascaris eggs or embryos in the lungs. In some of these, which were more chronic, tubercular-like masses were formed in the lungs.

8. The starting-point of the septic absorption in these cases of septicæmia was, in most instances, abscesses connected with the teeth. Four Wallabies had pyorrhœa alveolaris. Two of the cases were due to the pneumococcus; and in a Gayal abscesses in the kidney, due to calculi, were the starting-points.

9. The cases of broncho-pneumonia were nearly all confined to the first and last three months of the year. In four cases (Monkeys) Friedländer's bacillus was the cause.

10. Of the 38 Mammals, the actual cause of whose deaths was congestion of the lungs, 14 had rickets badly. In the Birds, and especially in the smaller ones, owing to the structure and partial fixation of the lungs, this condition is very fatal, and is generally associated with more or less œdema of the lungs, and sometimes with effusion of fluid into the air-sacs.

11. It will be seen from Table II. that a large number of animals—39—had fatty degeneration of the liver. Most of these were small birds, and it may in these be due to inevitable overfeeding with no natural exercise.

12. Peritonitis in Mammals was in three cases due to a sloughing appendix; in the Birds the inflammation had spread from the oviduct.

13. On account of the large number of cases of inflammation of the intestinal tract, the investigation into the probable causes which was begun in 1908 has been continued. It seems certain that there are five distinct varieties of enteritis in the Gardens: one caused by errors in feeding; one caused by foreign bodies, *e. g.* peat, sand, hay, grass, etc.; one caused by worms, or by worm-cysts, in the walls of the intestines; one caused by bacteria; and, lastly, one caused by protozoal organisms. The first, fourth,

and fifth of the above probable causes are by far the most important. With regard to the first, after every Bank Holiday there are one or more deaths due to over-feeding or to unsuitable food having been given to the animals. Again, in 95 out of 223 Reptiles there was an inflammation of greater or less extent of the alimentary canal, which—as was urged last year—would seem to suggest that the present unnatural and unphysiological method of feeding the Snakes is not the right one. Often masses of quite undigested food are found, the necessary secretions failing, apparently on account of the natural stimulus of killing the animal being absent.

Of enteritis proper, 13 of the cases in Mammals and 48 of those in Birds were hæmorrhagic and associated with necrosis of the mucous membrane; and protozoal organisms, mostly amœbæ, were found in 49 of these. The bacterial cases occur mostly in the autumn, and some of these, I think, will have to come under the first division, since it seems probable that—at any rate, in some cases— the use of boiled milk, as is the case in children, may be the cause.

14. In an Iguana with nephritis, causing almost complete destruction of the kidneys, uric acid crystals were found in numbers in the blood.

15. In this case occurring in a Bull-Frog the kidneys were entirely converted into a transparent cystic mass containing clear fluid, and measuring 3 by 2 inches; the tissues and body-cavity were full of fluid.

16. Three new growths have occurred this year: one in a wild Swine in which both kidneys and both adrenals were involved. There were two separate tumours, one on each side of the spine. One of these was sent to the Museum of the College of Surgeons. A second one occurred in the kidney of a Lemur, and the third in the ovary of a Styan's Squirrel. They all belonged to the group of Sarcoma and were all mixed: in the Swine a small round-celled variety, with much hæmorrhage; in the Lemur a round-celled and fibrous variety, rapidly growing; and in the Squirrel it was mostly of the large round-celled kind.

17. Under this heading are included animals which have died from exhaustion, due probably to depressed vitality from cold or darkness, or from inability to get or take food, as has been the case with many small reptiles.

18. In these cases there was very profound anæmia with considerable blood-changes. It is most probable that these cases were all parasitic in origin, but no cause, parasitic or otherwise, could be found. In a Turtle-Dove the very rare condition of phagocytosis of the red corpuscles by the leucocytes was observed.

4. Notes on the Hydroids and Nudibranchs of Bermuda *.

By Prof. W. M. SMALLWOOD, Syracuse University †.

[Received November 15, 1909.]

(Text-figures 7–10.)

The writer spent the month of January 1909 in Bermuda, studying at the Biological Station on Agar's Island. The courtesy of the use of the Station was extended to me by the director, Professor E. L. Mark, to whom I express my thanks. The specific problem of research was an inquiry into the condition of the living nerve-cells of nudibranchs; but in addition some observations were made that may be worth recording.

Hardly a day passed that one or more *Aurelia* were not seen. Most of the specimens were small and none showed mature gonads. Vast quantities of sargassum were blown on to the various islands, and on all of this the common summer hydroids were found. Specimens of *Clytia simplex* and some unidentified campanularians were repeatedly examined, but on none of them were gonothecæ present. *Aglaophenia minuta* was taken the latter part of January with many empty gonosomes; but other than this the hydroids on the sargassum did not show any signs of sexual activity.

Lytocarpus philippinus was in a very active healthy condition during the month and showed plenty of vitality by forming numerous asexual branches, but no gonosomes were noted. Congdon (**07**) speaks of slight variations from Nutting's description, in that "the colony [is] shorter." All of the colonies collected by us were at least eight inches high and some of them nearly a foot. They were taken in shallow water off Fairy-land Point.

Eudendrium hargitti was taken at Hungry Bay the last week in January. Two large colonies, about three inches high, were found; one of them was in fruit, the orange-coloured gonophores being very conspicuous.

One new hydroid, which has been handed to Professor Hargitt for description, was found growing on *Zoöbotryon pellucidus*.

The writer regretted very much that the weather was unfavourable for collecting in Castle Harbor, where further opportunity would have been afforded to study the winter conditions of *Pennaria* and other hydroids.

CHROMODORIS ZEBRA Heilprin. (Text-fig. 7.)

This is one of the largest nudibranchs of Bermuda. It was first described, briefly, by Heilprin (**89**. p. 187, pl. 15. figs. 3, 3*a*), as follows:—"Animal of the form typical of the genus; head portion considerably extended and expanded in motion; caudal portion moderately elongated; base flattened; mantle beaded immediately over the tail.

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* Contribution from the Bermuda Biological Station for Research, No. 18, and from the Zoological Laboratory of Syracuse University.

† Communicated by Dr. P. CHALMERS MITCHELL, M.A., D.Sc., F.R.S

"Color bright blue above, variously lined and streaked with light yellow; on the dorsal surface the yellow markings are disposed in longitudinal wavy or nearly straight lines, one or more specially prominent lines along the dorso-lateral border. Sides of animal irregularly reticulated or angulated with yellow markings; under surface pale blue, bordered with faint yellow. Rhinophores deep indigo or black, the rhinophoral aperture bordered with yellow; gills 12 or 13, black, bordered with yellow, and carrying blue cilia; under surface of head blue, with yellow spots.

"Length, when expanded, three and a half inches. Three specimens, dredged in about ten fathoms on the north side of Harrington Sound."

The few observations by Heilprin on the internal anatomy do not serve to distinguish this species from the other Chromodoridæ and so are omitted. He gives two rather generalized figures with but little accurate detail.

Other than the above, no description of this species has been made, so far as I have been able to determine. Bergh (92) questions whether *C. zebra* is a distinct species from *C. villafranca*, but this can not be settled until the anatomy has been thoroughly worked out; this will be done in a separate paper. The following observations on the external morphology add a number of facts to Heilprin's description.

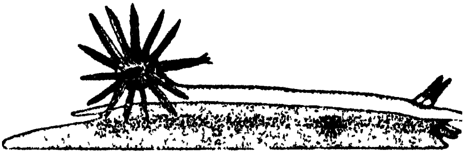
Over fifty specimens were available for observation during the month, which gave ample opportunity to note a number of variations. The length of the body from the anterior tip of the mantle to the posterior end of the foot is 16 cm. This is the average length of the animals as they were crawling around in the aquaria. The body is much elongated and linear; it is thickest just anterior to the branchial plumes, becoming slightly depressed anteriorly. The mantle is rounded at each end and a little wider than the foot; it is slightly broader in its anterior than in its posterior portion, and projects beyond the end of the tentacles. The foot is uniformly narrow and linear; it tapers off to a point posteriorly, but its anterior end is squarish with rounded corners.

The ground-colour of the animal is blue. The foot is pale blue, but the intensity of the colour varies with different individuals. The margin and posterior tip are almost free from this ground-colour. The bottom of the foot is not modified by any other colour. The protrusible pharynx is likewise deeply coloured with a similar unmodified blue. This ground-colour of blue is not as conspicuous on the rest of the body, where there is a series of irregular streaks and a mottled effect produced by colours which range from a dark olive to orange. These markings are by no means the same in all individuals. In fact, of two dozen animals collected from the same spot at the same time, no two specimens were found to be alike. The dorsal margin of the foot is free from the olive to orange colours, and the under edge of the mantle is generally so. The number of streaks and mottles is not constant. About 5 mm. back from the rhinophores and a little nearer the median plane, there are two oval spots of light blue, which are constant in position but not in shape nor in relation to the streaks.

The tentacles are short, retractile, conical, and blue in colour.

The rhinophores are perfoliate with 28 leaves in the clavus. The clavus is of a deep ultramarine blue, the deepest colour seen anywhere on the animal. The rhinophores may be retracted within conspicuous collars, which have smooth margins.

Text-fig. 7.



Chromodoris zebra Heilprin.

Viewed from the right side; the branchial rosette turned toward the observer. ⅞ natural size.

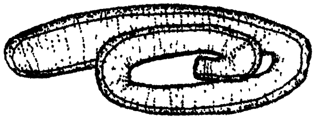
The branchiæ are from 12 to 14 in number; they are surrounded by a high sheath with a smooth margin, within which they are completely retractile. In the olive-coloured forms the branchiæ are often more deeply coloured than the mantle, and in such forms the backs of the plumes are slightly bronzed. The more orange-coloured individuals have light coloured branchiæ, which are frequently lighter in colour than the mantle. The branchiæ when fully expanded are rosette-like in outline and extend beyond the body. When in this expanded state, one readily notices an inner flesh-coloured collar that expands beyond the limits of the mantle-collar. The anal opening is subcentral, the ring formed by the bases of the branchiæ being open on the posterior and ventral margin. The tip of one or two of the branchiæ is seen to end in a minute division into two, three, or four parts. This is a very common characteristic, so that one hunts for some time before finding an animal which does not show it; only two such specimens were noticed. The gills occupy both sides of the plume as a series of about fifty leaves.

On the ventral, posterior border of the mantle there are five or six white conical elevations, which produce the beaded effect mentioned by Heilprin. The whitish colour is due to the presence of numerous globular structures, which turn pinkish in strong nitric acid. They were not destroyed, nor was there any effervescence, in nitric or hydrochloric acids. These white conical papillæ are noticeable in the living animal, but become more conspicuous after the animal has died.

The mouth is circular.

The genital opening is lateral and about one-third of the distance from the rhinophores to the branchiæ. It is noticeable as a slight prominence, which is blue in colour. The oviduct is protruded during oviposition and has the pale blue ground-colour. The deposition of the eggs does not seem to occur at any set time during the year. Mr. Mowbray has found eggs during every month of the year, and I secured a large quantity of them during January, 1909. The eggs are laid at any time during the day and often during the night. The external orifice of the oviduct is widely distended, a centimetre or more, and one can see the eggs within this opening for some distance, about 5 mm. The egg-mass (text-fig. 8) is in the form of a long, thick ribbon, often 150 mm. long and 15 mm. wide. When free from the animal, this ribbon tends to coil up, and it firmly adheres to the side of the aquarium by one of its edges. Two animals were timed during a part of the act of deposition, and from this as a basis I should estimate that the complete process would take three hours.

Text-fig. 8.



Egg-mass of *Chromodoris zebra* Heilprin.
Seen obliquely. ⅓ natural size.

An hour after the animal ceased laying, some of the eggs, but not all of them, showed two polar bodies. The eggs are laid in the jelly as a continuous string, which takes the form of a somewhat flattened spiral, so that when the broad face of the ribbon is viewed the string usually looks as though regularly folded back and forth across the ribbon. There are about one hundred eggs in a complete turn of the spiral, although this number is not constant. As there are from eighty to one hundred complete turns of the spiral, this would give from eight to ten thousand eggs to a single laying. It would be interesting to know how often each year they are capable of depositing such large numbers of eggs, but it is doubtful if this can be determined, as they are not hardy, soon dying even when placed in running water. It is probable that they come from the deeper water only to spawn, spending the rest of their time at some distance from shore. The egg are of a reddish-brown colour and develop slowly, as is shown by the fact that four and one-half hours after deposition they are still in the one-cell stage.

In the first lot of *Chromodoris zebra* collected there were over thirty specimens. The variation in colour was marked; one specimen of especial interest escaped my attention for a couple of days. This individual on close inspection proved to be a kind of albino. In size, shape, and general habits, it was undoubtedly the same as the other individuals collected at this time, but the bluish ground-colour was entirely wanting. The following colour differences were conspicuous. The foot was white with no blotches or spots of any colour. The protrusible proboscis was entirely white. The rhinophores were of a light brown tipped with white. The collar of the branchial plumes showed an absence of colour, as did the back of each plume, so far as any ground-colour was concerned, a few spots of orange only remaining. The gills were colourless. The remainder of the body was streaked and mottled with a bright orange, but between these orange spots there was an entire absence of the usual ground-colour. Even in a preserved state, this albino can readily be distinguished from specimens which have the usual ground-colour of blue.

FACELINA AGARI, sp. n. (Text-fig. 9.)

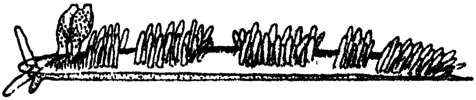
It is impossible to be certain to which of the Eolidæ this species belongs, because only a single specimen was found, and the differences between the several subdivisions are so slight that a critical study of the morphology of a new species is necessary before one can feel certain where to place it. This form resembles *Facelina bostoniensis* more than it does any other one of the Eolidæ that I have thus far examined; but *F. bostoniensis* is referred to by Bergh (**92**, pp. 36, 40) under the name *Corphella* as well as *Facelina*. This seems to indicate that there is a considerable difference of opinion in reference to *F. bostoniensis*, and the same is true of several other forms. As soon as I can obtain more animals of this species, I hope to work out its anatomy in a critical manner, but until then I shall regard it as one of the Facelinidæ. This specimen was found under stones on the shores of Agar's Island, on which the Bermuda Biological Laboratory is located; so it seems appropriate to give it the specific name *agari*.

The body is long and slender—30 mm. long and 2 mm. wide. The rhinophores are club-shaped with conical tips, slightly contractile, and covered, except at the tip and base, with numerous small blunt tubercles. The presence and the shape of these tubercles on the rhinophores are a distinguishing characteristic of this form, and make one hesitate to place it in the genus *Facelina*, where the rhinophores are usually slender and perfoliate; however, this latter character is not a constant one.

The head is rounded, narrow; the tentacles occupy the sides of the head, and are conical, small in diameter, and longer than the rhinophores. Their surface is irregularly roughened. The foot is rounded anteriorly and bears a pair of distinct, angular, auriculate processes, which at first are easily mistaken for a second pair of head-tentacles. They are the foot-tentacles. The foot gradually tapers behind to a sharp point, the least bit of which can be seen posterior to the waving branchiæ. The foot is colourless and wider than the body.

The branchiæ are numerous and arranged along each side of the body in several (six) more or less distinct groups. On the left side, lateral to the rhinophore, there are in the first group nine *very small* branchiæ. These are followed without any noticeable interval by twenty-one branchiæ of larger and uniform size. These all arise from near the edge of the dorsum, but bend over so as to give the appearance of growing out of the middle as well. In the third group of the left side there are twenty-two branchiæ, part of which grow out of the middle of the back. Then follows a free space about equal to the area occupied by the third group; next comes the fourth group with fifteen branchiæ, several of which are small. A few of these likewise arise from the middle of the back. Between the fourth and fifth groups there are two small branchiæ close to the foot (not shown in the figure). In the fifth group, nine were counted. The rest of the dorsum and side of the body has fifteen; these extend quite to the tip of the tail and entirely cover the body in this region. On the right side of the body, taking the branchiæ in the same order as on the left, first, there are nine small ones followed immediately by twenty-five: in the next (third) group twenty-four, then (fourth) thirteen, (fifth) eleven, and in the final group twenty-four.

Text-fig. 9.



Facelina agari, sp. n.

Viewed from the left side. Magnified 2 diameters.

Between the fourth and fifth groups on the right side there was one small branchia. These enumerations show that the total numbers (90 and 107) on the two sides of the body are not the same, and that the corresponding groups may differ widely in number. The branchiæ have an oscillating movement, which is quite regular when the animal is undisturbed.

The colour of the body is light chocolate. There are a few splotches of this colour on the dorsal-anterior portion of the foot. The portion of the body free from the branchiæ looks to the unaided eye as if there were numerous minute white spots all over it. Under the microscope, on a black background, these spots are seen to consist of from one to many white spherules grouped in a variety of odd shapes. These white spots thus viewed are so prominent on the light chocolate background, that they appear to be minute roughened areas; they do not, however, project beyond the surface. The branchiæ, especially those nearest the dorsal line, have a slight bluish colour around the base. Each branchia has a ground-colour of light chocolate with many white splotches irregularly disposed. The white splotches are many times larger than those on the dorsum. The tentacles have similar white splotches, but they are more numerous. The rhinophores are slightly darker than the rest of the body, having less of the white. Near the tip of most of the branchiæ there is an irregular band of white; distal to this there is a narrow band of the ground-colour surrounding a central spot of white, which gives the appearance of an opening at the end of each branchia.

Extending from near the origin of each tentacle to the anterior edge of the base of the rhinophore of its own side, is a series of small tubercles. A similar row of tubercles runs laterally from the posterior base of each rhinophore, while a short row appears between the two rhinophores.

The species is hardy, living for some time in confinement.

The anal opening is lateral and is about one-third of the distance from the anterior to the posterior end of the body.

POLYCERELLA ZOOBOTRYON, sp. n. (Text-fig. 10.)

The genus *Polycerella* was established by Verrill (**80**, p. 387; **82**, p. 548) in 1880, when he described *P. emertoni*, taken at Wood's Holl in 1875 and later at New Haven and Newport. Since that time there have not been any additions to this genus.

The present species was first observed by Mr. L. Mowbray in December 1908, while he was trying to determine the reproductive stages of *Zoobotryon pellucidus*. At present it seems to live on this bryozoan and not on any of the other organisms growing near it. Several specimens were taken during my stay in Bermuda, and in every instance they were found on this bryozoan. The fact that *Zoobotryon pellucidus* has recently taken up quarters in Bermuda, would seem to indicate that this habitat was also recently assumed by this species of *Polycerella*, especially as this bryozoan was under observation during the past summer and no nudibranchs were seen upon it. It is also probable that this nudibranch did not come to Bermuda with *Zoobotryon*, because the genus is very abundant in several localities and has been thoroughly studied by Reichert (**70**), and yet no mention has ever been made of a nudibranch belonging to the *Polycerella* in connection with it.

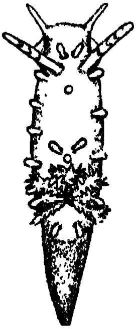
Polycerella zoobotryon is a small nudibranch, from 5 to 6 mm. in length and 1½ mm. wide. The body is thickest just anterior to the branchial plumes. The shape is much as in *Polycera*—elongated, narrow, and about as high as broad. Body compressed, smooth, sloping rather abruptly from the branchial plumes posteriorly until it merges into the long pointed tail, which is much narrower and thinner, and nearly one-third the total length of the animal. The head is blunt and squarish. The tentacles are cylindrical, non-retractile, and one-fourth the length of the rhinophores.

The rhinophores are non-retractile, cylindrical, each having from three to six cup-like, equidistant folds on the posterior surface of its distal two-thirds.

On the sides and dorsum of the body there are a number of short clavate papillæ, the tips of which are translucent. The number is not constant, but ranges from 16 to 19. Their distribution is as follows:—Of eight which are constant in position, two occupy the median plane, one of them behind the rhinophores about one-sixth of the distance between base of branchial plumes and rhinophores, the other in front of the plumes about one-fourth of the same distance. The remaining six are arranged in pairs near the median plane, one pair a little in front of the rhinophores and distant from each other about the thickness of a papilla; a second pair slightly in front of the posterior median papilla and a little further apart than the anterior pair; the third pair nearly as much behind the plumes as the posterior median papilla is in front of them; these are still further from each other.

In addition to these eight papillæ, there are on the dorsum near its lateral margins from eight to eleven papillæ. There are four on each side, or four on one side and five on the other, or, finally, five on one side and six on the other.

Text-fig. 10.



Polycerella zoobotryon, sp. n.

Dorsal view. Magnified 8 diameters.

The ground-colour is whitish, mottled with light brown arranged in irregular splotches. A less abundant darker brown is disposed in streaks across the lighter brown. The foot is white and without any colour markings. Its margin, as well as the tips of the papillæ, is translucent.

The foot is smooth and slightly notched anteriorly. The mouth is T-shaped. The anal opening is subcentral in position, and the excretory orifice is just posterior to it, both being surrounded by the gills.

The gills consist of four or five more or less irregularly branching plumes.

When at rest the body is shortened, the tentacles drop back alongside the body, and the rhinophores lie on the dorsum. The papillæ, which are constantly in motion when the animal is crawling, are bent dorsally when it is at rest, and are often knobbed.

Under a low power lens one can see the long cilia in motion. The animal assumes a variety of positions while in this resting state, and it frequently rests on its back. The foot may be fully expanded or much contracted. When the animal was placed in a weak solution of methylene-blue in sea-water, the cup-like folds on the rhinophores appeared as swellings, and after a few hours the lateral papillæ and rhinophores were sloughed off.

The eggs are laid in a cylindrical mass of jelly. The number varies from one hundred to three hundred in each mass. Each animal lays several egg-masses.

The animals are very hardy, living in confinement for over six weeks.

A paper on the anatomy of this species is well under way and will be published separately.

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February 1, 1910.

Prof. E. A. Minchin, M.A., Vice-President,
in the Chair.

Mr. Charles A. Darling, General Manager of the British New Guinea Development Co., exhibited a mounted specimen of a Cuscus (*Phalanger maculatus*). The animal had been captured in New Guinea and brought to England alive, but had subsequently died, and was to be presented to the British Museum (Natural History) by its owner, Mr. D. Elliot Alves. Mr. Darling called attention to the soft white fur with brown spots and the prehensile tail, and stated that when the living animal was asleep in daylight the eyes remained open with the pupils fully contracted.

Malaria and the "Millions" Fish (Girardinus pœciloides).

The Secretary read the following letter which he had received from Captain J. A. M. Vipan, F.Z.S.:—

"During the last eighteen months a great deal has been said regarding the absence of fever in Barbados and the cause of this immunity, which has rightly been put down to the presence in great numbers of a little fish, *Girardinus pœciloides*, locally known by the name of Millions, which feeds on water crustaceans and insects including the larvæ of the mosquito, and from being in such vast numbers, very effectively keeps down this insect and consequently malaria. Now the reason of this little fish being found in such vast quantities all over the island of Barbados is not difficult to state, for it happens to be the only fresh-water fish on the island and consequently has no enemies in the fish line to reduce its numbers.

"In the island of Trinidad, where there is a certain amount of fever, there is another little fish, *Girardinus guppii*, but in restricted numbers, as there are plenty of other and larger fishes in the fresh waters that keep it from multiplying to any great extent.

"On the mainland in Venezuela where fever is rife, there is also a little Cyprinodont, *Pœcilia reticulata* Peters, but there are also great quantities of other fishes.

"These three little Cyprinodonts—*Girardinus pœciloides*, *Girardinus guppii*, and *Pœcilia reticulata*—I have kept for some years in an aquarium, and I have found that they all interbreed freely and am quite sure they are all the same species under different names.

"That being so, and the fact that in Venezuela and Trinidad, where these fishes are indigenous, there is an abundance of fever, what can be the use of expending large sums of money in importing some of these little fishes to other fever-stricken countries such as Nigeria, for even supposing they survive the attacks of other fish, how could an importation of a few hundreds or thousands be of any use in the great watershed of the Niger;

whilst, moreover, there are a good many species of an allied genus (*Haplochilus*) distributed all over the West Coast of Africa, and all of which feed freely on the larvæ of the mosquito."—J. A. M. VIPAN.

The Secretary added that whilst he shared Captain Vipan's scepticism as to the efficacy of attempts to suppress malaria by importing "Millions" and endeavouring to establish them in new localities, he had thought it right for the Society to assist any experiments that were being made. The Agricultural Department of Barbados had arranged to send from time to time consignments of "Millions" to the Zoological Gardens, and supplies of the fish had been sent through the Colonial Office to various tropical colonies. So far as he was aware, there had as yet been no practical results.

The Secretary, on behalf of Col. Sir A. H. McMahon, K.C.I.E., C.S.I., F.Z.S., exhibited some specimens of the Cicada (*Sena quærula*) collected at Quetta, Baluchistan, which had been visited with great swarms of these insects in 1909. Similar swarms had been known to occur at intervals of about six years. The Cicada bores a hole in the ground, apparently intended merely to hold the insect during its pupa stage. Each hole is separate and quite open, holds only one pupa, and is bored vertically to a depth varying from 11 inches to 2 feet. In diameter it is about half an inch, but widens slightly at the bottom.

Dr. R. T. Leiper, F.Z.S., exhibited a series of specimens of Entozoa, viz.:—

(*a*) A sexually mature Guinea worm (*Dracunculus medinensis*) that had recently been found by Mr. Charles Grey in a leopard at Broken Hill, N.W. Rhodesia. Guinea-worm is normally a parasite of man, but very occasionally it attacks horses and dogs. This is the first record of its occurrence in the leopard. The discovery of the parasite in Rhodesia is also of considerable interest, for the Equator forms the southern limit of the endemic area of the disease amongst the natives of Africa.

(*b*) A Nematode from the body-cavity of the Tsetse-fly (*Glossina palpalis*), found by Dr. A. Gray, R.A.M.C., at Entebbe. The specimen, three inches in length, is an immature female *Mermis*.

(*c*) A series of round worms from horses that had lived in London for several years. The specimens included:—*Ascaris megalocephala*, *Oxyuris curvula*, *Strongylus equinus*, *Strongylus edentatus*, *Strongylus vulgaris* (developmental forms of this worm causing aneurisms of the abdominal aorta), *Triodontophorus serratus*, *Gyalocephalus capitatus*, *Cylichnostomum elongatum*, *Cylichnostomum* sp. n. The *Sclerostomum tetracanthum* Mehlis was absent. The parasites were present in considerable numbers, and it seemed evident that they reached London as semi-dried larvæ encysted upon hay.

The following papers were read:—

1. On a Collection of Freshwater Crustacea from the Transvaal. By Paul A. Methuen, New College, Oxford *.

[Received October 30, 1909.]

(Plates VIII.–XVIII.†; Text-figures 11 & 12.)

Introduction.

In the beginning of August 1908, I had the opportunity of visiting the lake district of the Transvaal while out in that country during the Oxford summer vacation. The lakes or pans visited lie in the Carolina district due east of Pretoria near the borders of Swaziland. My object was to study and make as complete a collection of the Crustacean fauna as I could in the time at my disposal. I made Chrissie my headquarters.

Though not the highest point of the veldt, Lake Chrissie is some 6000 feet above the sea-level, and is situated in a slight hollow in the hills; in fact the word "pan" applied to these pieces of water ideally expresses their chief feature, in that they resemble shallow basins to be found in certain parts of the undulating stretches of the veldt. The Ecca sandstone of the Karroo formation characterises the geology of this district. At the time I was there all the pans were very empty, some of them had completely dried up.

It was cold most of the time, especially during the nights.

Lake Chrissie is about twelve miles in circumference: on the north side the lake is shallow and tends to deepen very gradually towards the centre, where it was found to be five or six feet deep; approaching the southern margin, the tendency is to deepen another foot or two and then to shallow rather rapidly. Though there are no reeds, various weeds grow plentifully in the shallows, especially in the northern parts. Many species of wild-fowl frequent the western end of the lake where it has of late years considerably receded, leaving mud flats behind. Most conspicuous among the birds was the flamingo, whose contrasting colours of black and crimson when on the wing were most striking towards sunset. The bottom of the lake is composed of fine mud. The water was very discoloured, owing to a great extent, I presume, to the activity of the large number of birds on it, and savoured strongly of wild-fowl.

It was in the shallow littoral water that I found the Entomostraca described in this paper, the Ostracoda on the muddy bottoms, the Cladocera and Copepoda a little farther out among the weeds. A small species of Barbel (*Barbus anoplus* Max

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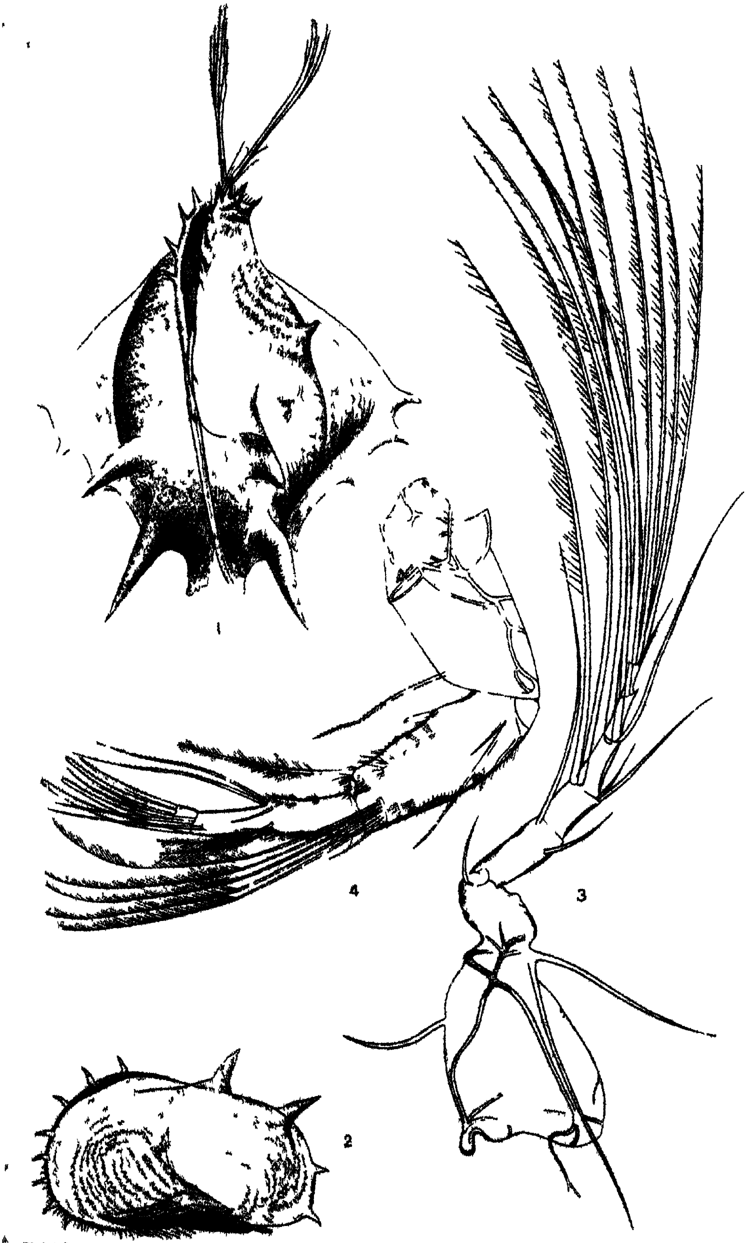
* Communicated by Prof. G. C. Bourne, D.Sc., F.Z.S.

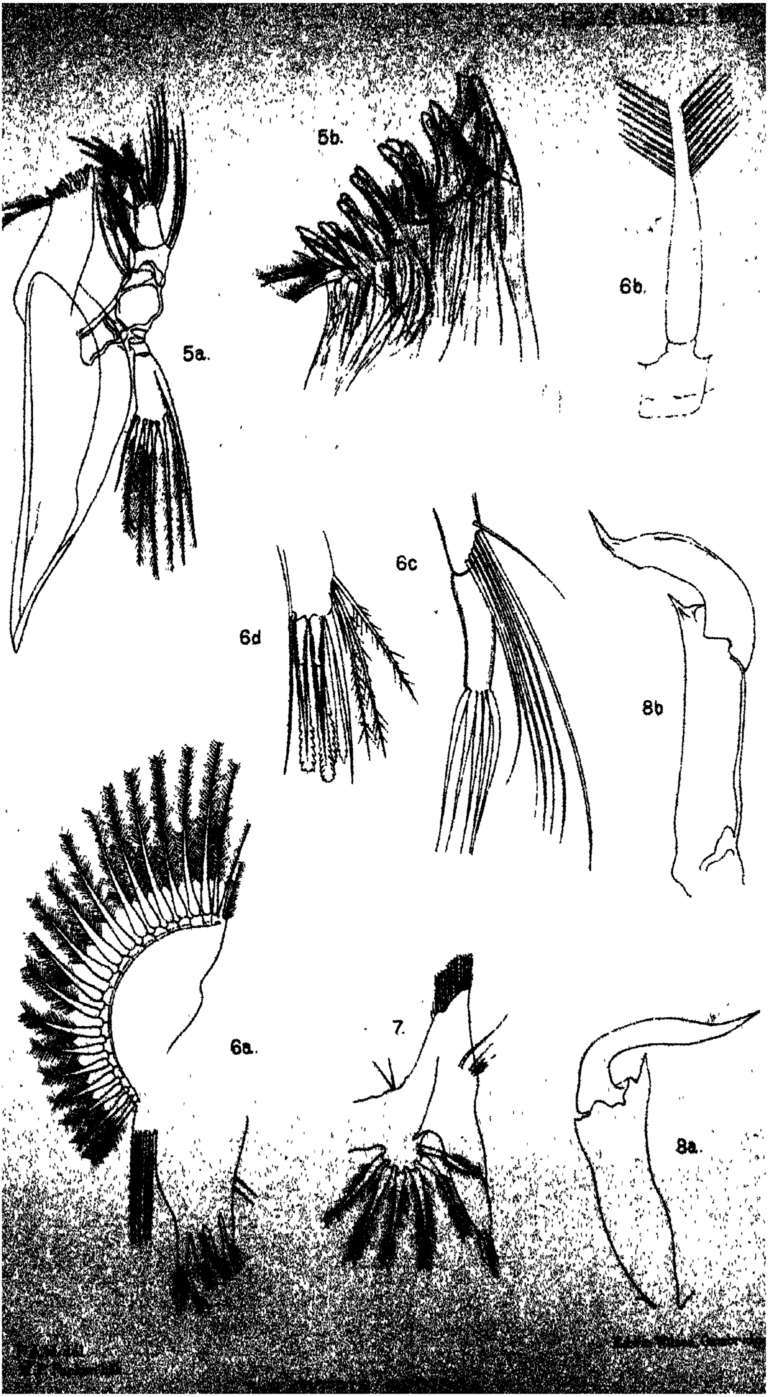
† For explanation of the Plates see pp. 165 & 166.



P.A.M. del.
M.P. Parker lith.

E. Wilson Cambridge

1-4. CYPRIS SPINOSA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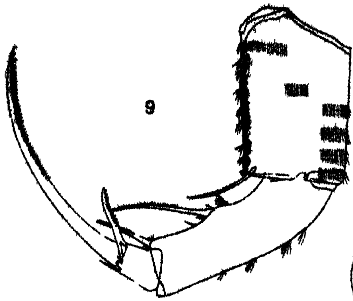
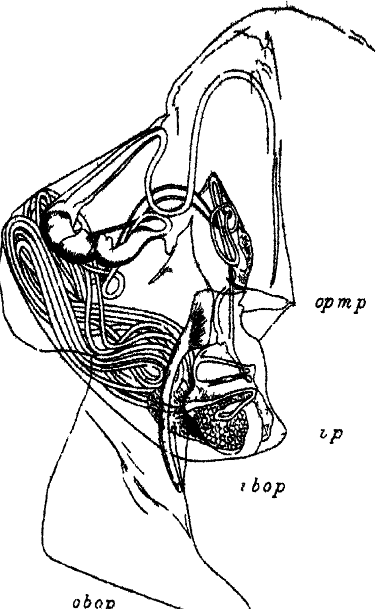
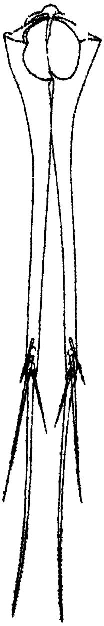
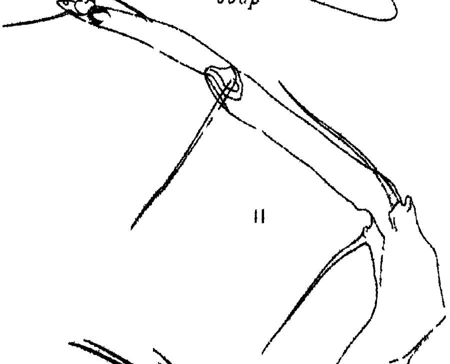
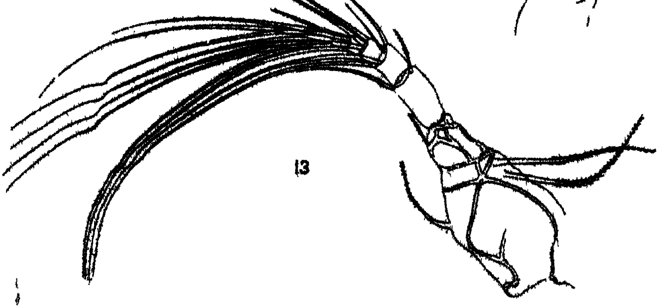






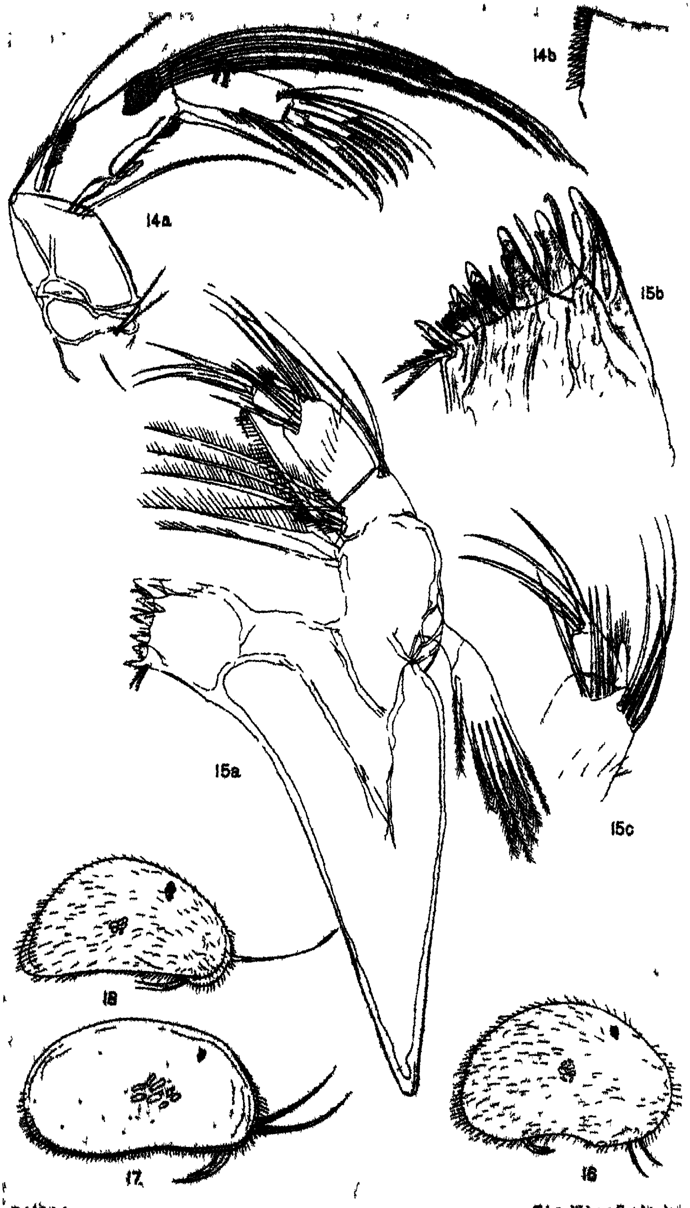




R.A.M. del.
M.P. Parker lith.

Edwin Wilson, Cambridge

9–13. [illegible]



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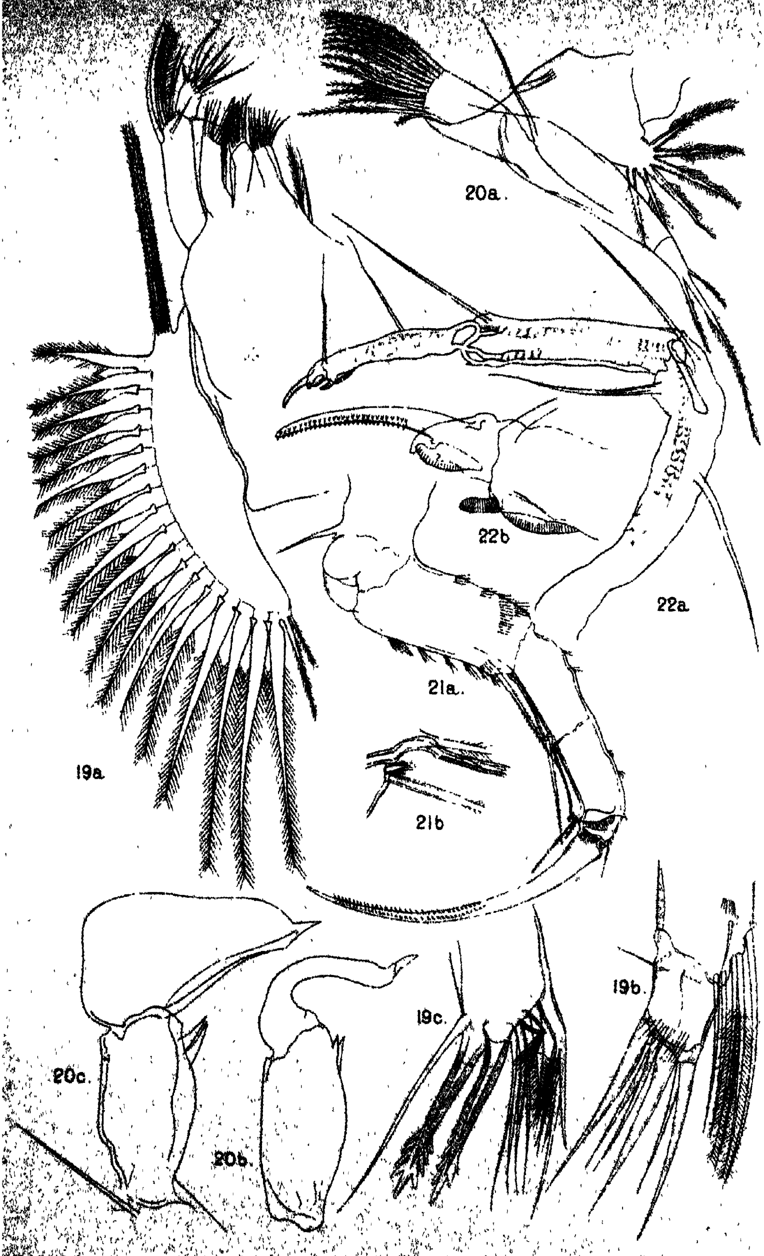
M.P. Parker lith.

Edwin Wilson, Cambridge

14, 15, 17. C. DUNNINGI. 16. C. CHRISSIENSIS.
18. C. MASTIGOPHORA.



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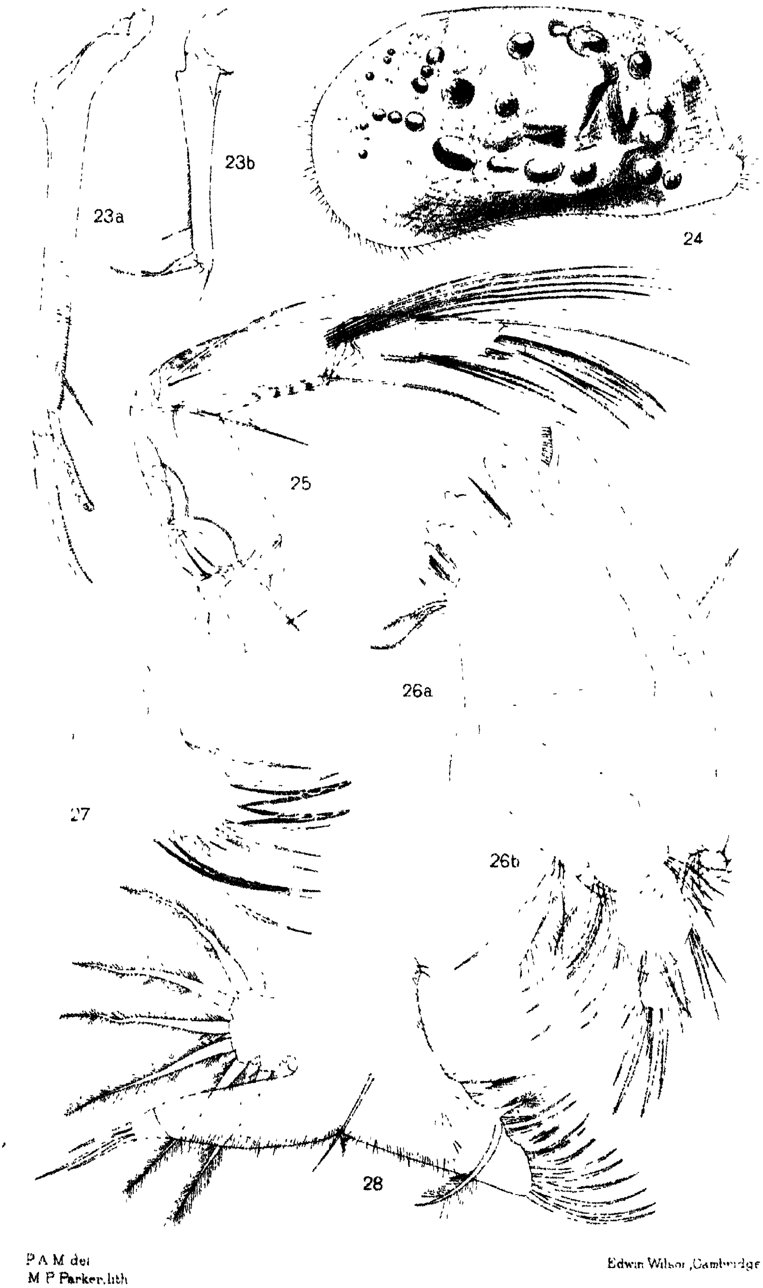
M.P. Parker, lith.

Edwin Wilson, Cambridge

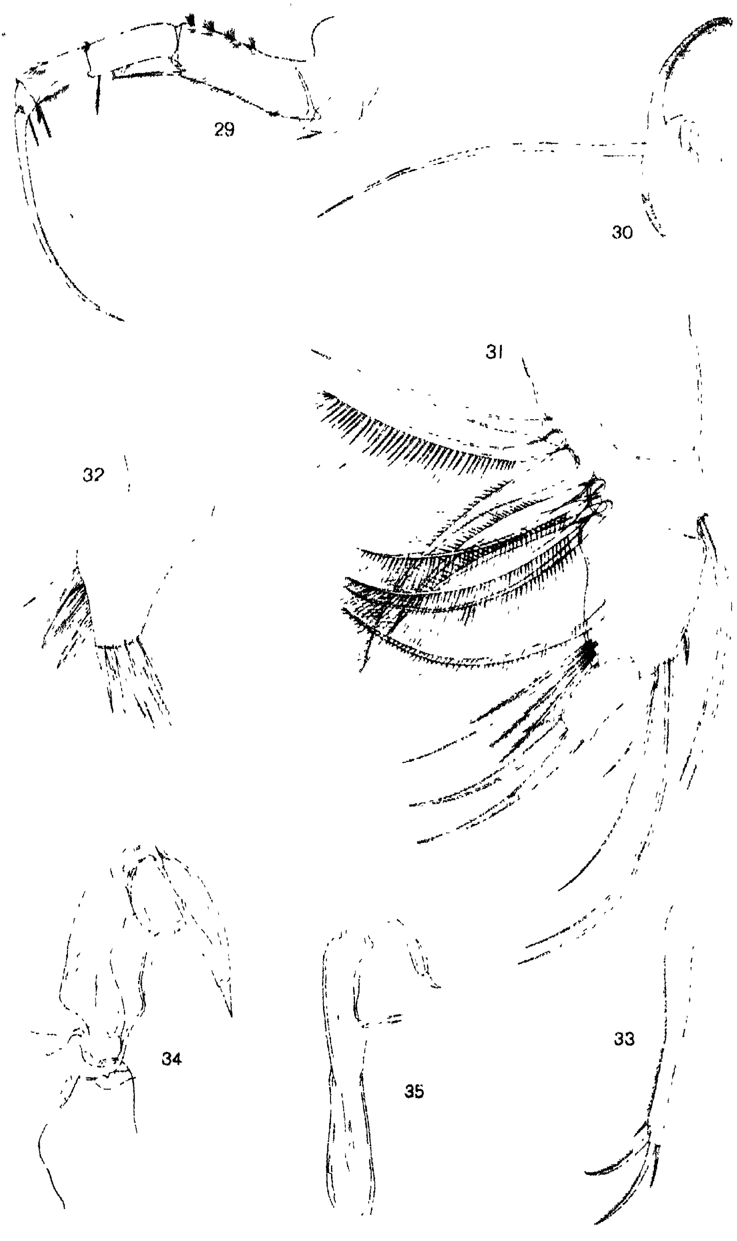
19–22. C. GUNNINGI



P A M del
M P Parker, lith

Edwin Wilson, Cambridge

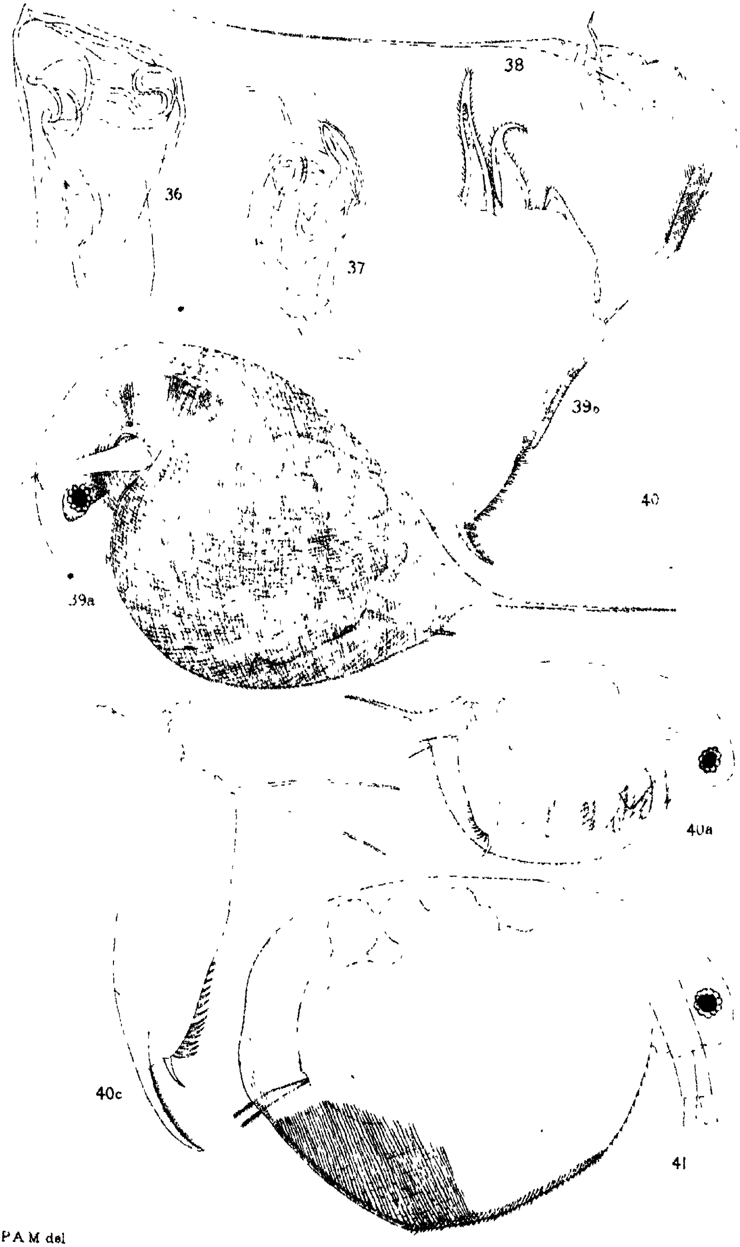
23. C GUNNINGI 24-28. C TUBERCULATA



P. A. M. del.
M. P. Parker, lith.

Edwin Wilson Cambridge

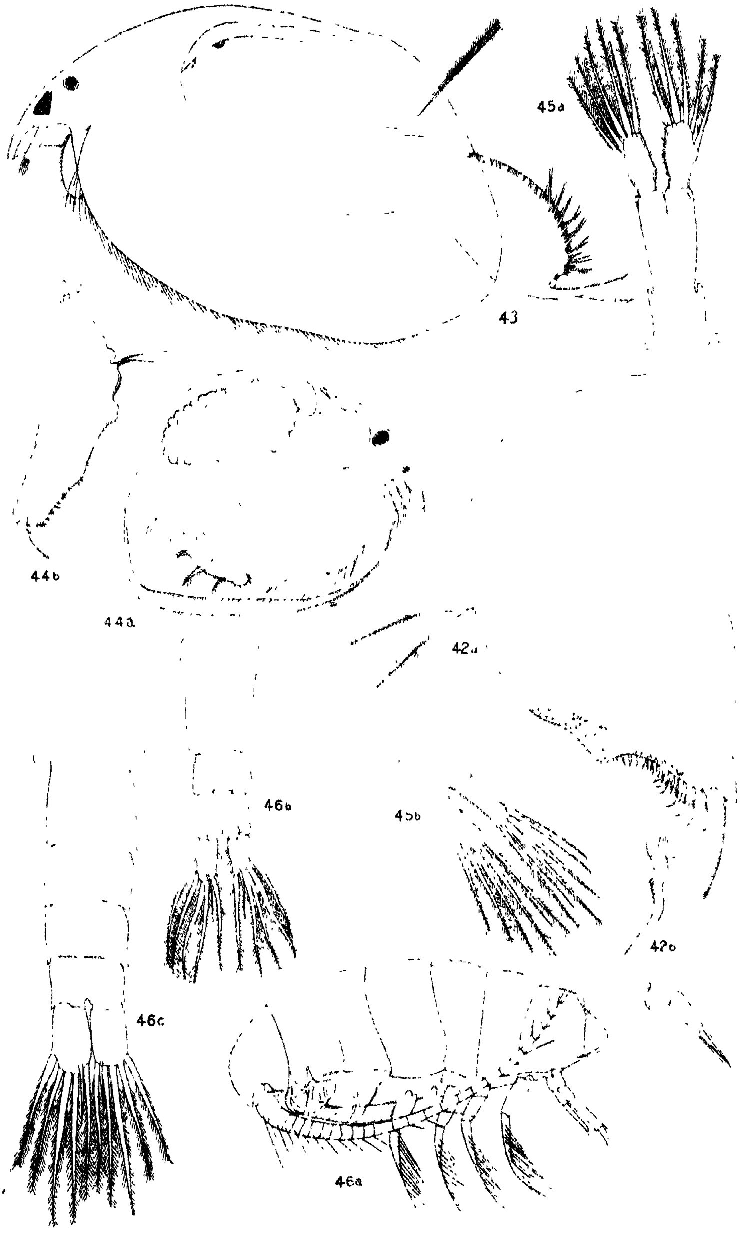
29, 30, 33. C. TUBERCULATA. 31, 32. C. MASTIGOPHORA.
34, 35. C. CHRISSIENSIS.



P A M del
M P Parker, lith

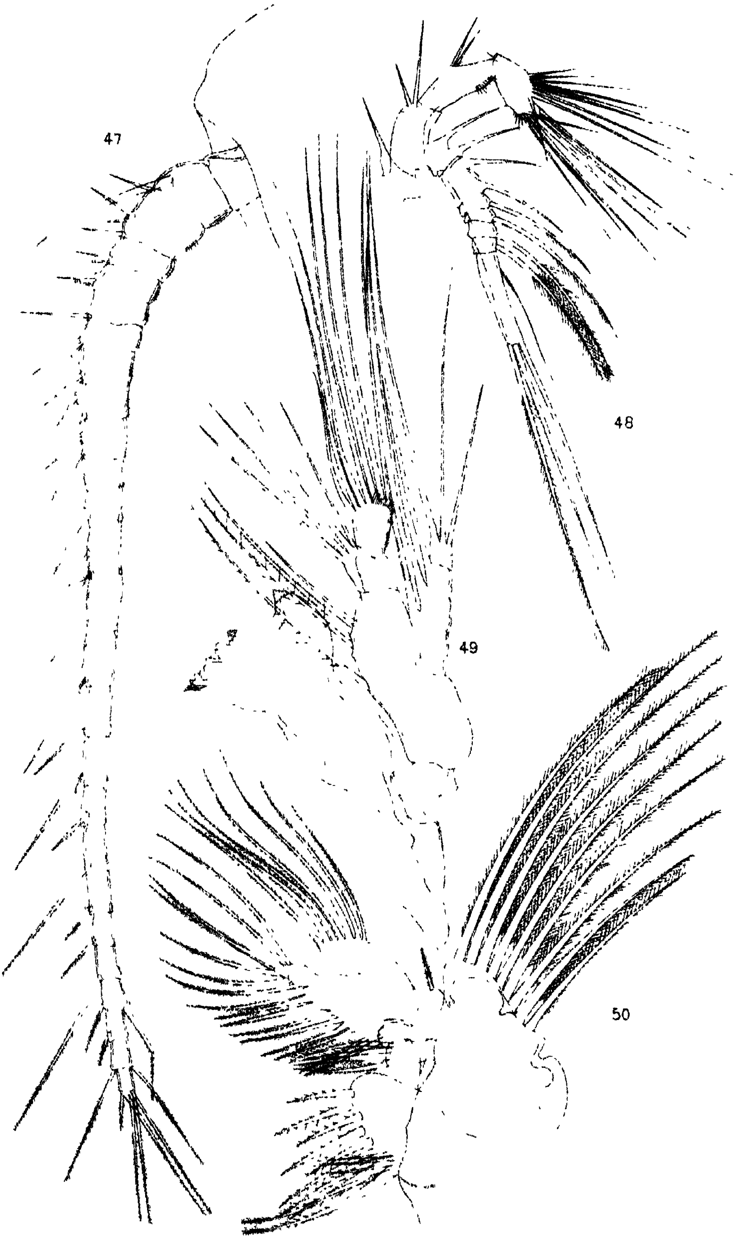
Edwin Wilson, Cambridge

36 C GUNNINGI. 37.C CHRISSIENSIS 38 C MASTIGOPHORA
39 DAPHNIA GIBBA. 40.D PULEX 41 SIMOCEPHALUS CORNIGER.



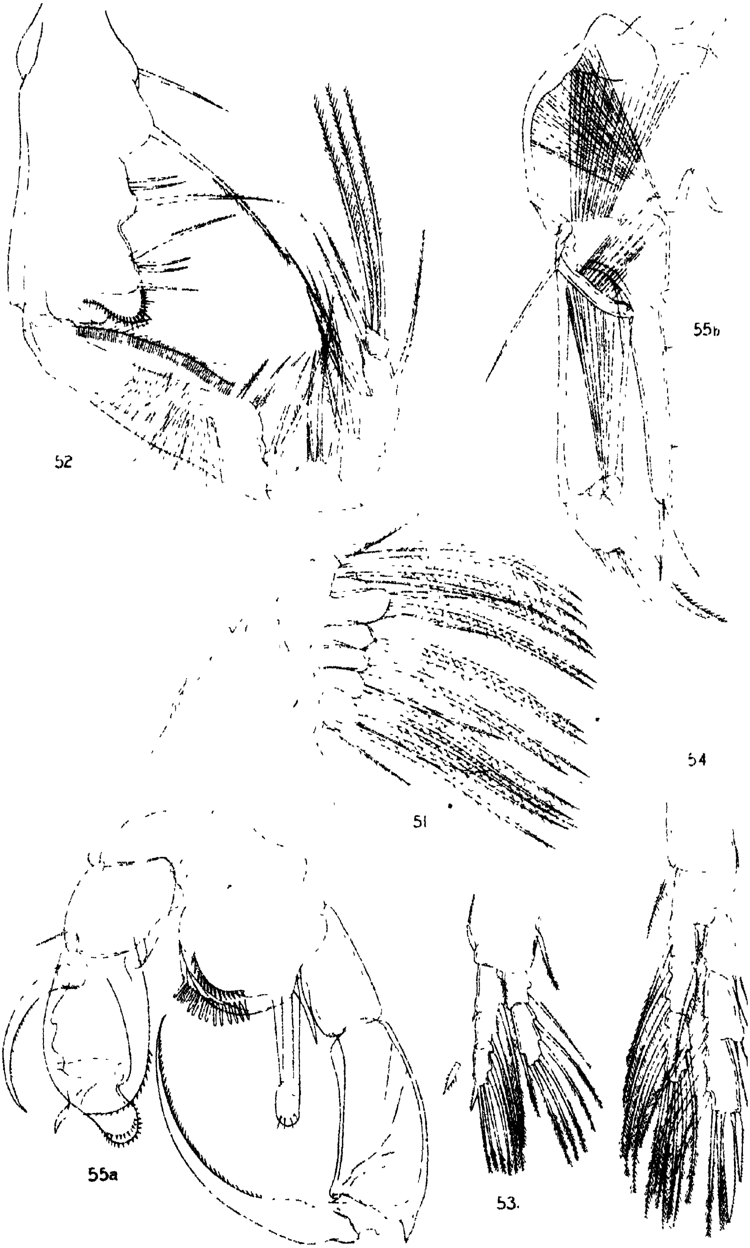
P.A.M. del
M P Parker, lith
Edwin Wilson, Cambridge

42. S CORNIGER 43 LEYDIGIA TRISPINOSA 44 CHYDORUS CAROLINÆ
45 BROTEAS FALCIFER 46 METADIAPTOMUS TRANSVAALENSIS



P A M del
M P Parker, lith
Edwin Wilson, Cambridge

47 50 METADIAPTOMUS TRANSVAALENSIS



P A M del
M P Parker, lith

Edwin Wilson, Cambridge

51-55 METADIAPTOMUS TRANSVAALENSIS

Weber)* used to come into my tow-net, when dredging through the weeds; this was the only fish I came across, and I was told that no other existed there. I might also add, that an effort had been made to introduce a large species of Barbel but without success.

Besides Lake Chrissie there are about a dozen other pans, none however approaching that lake in size. The larger pans are as a rule without reeds; the smaller ones may be completely overgrown. In the case of the former, the bottom may be composed of sandstone with little or no mud present; in the latter case, fine mud is always present, very often of some depth. Very few pans were at the time dry, but all of them, during certain seasons after droughts, dry up completely; most of them depend for their supply of water on rain fall; others like Lake Chrissie are furthermore fed by small spruits. Generally speaking the water is somewhat brackish.

As to local distribution, I found most species of Entomostraca in Lake Chrissie, but this result may be merely due to the fact that since I had not the time to dredge all the pans very thoroughly, I thought it best to pay most attention to Lake Chrissie and to visit others but once or twice.

A feature of interest among this entomostracan fauna is, that out of the six species of Cypridæ here described, in five males and females were found in about the same proportion. No doubt this interesting fact is correlated with the frequent drying up of the pans, thus agreeing with the Cypridæ of South-West Africa as noticed by Vavra (**11**), and differing from their European freshwater representatives in which males occur so rarely that some species are known only by descriptions of females †.

The species collected throw some not altogether uninteresting light on recent theories of distribution, and tend to confirm these theories. This paper will, I think, have added some evidence in favour of those who contend that South Australian, Tasmanian, New Zealand, and South American forms have been independently derived, perhaps through some Antarctic continent, from those now found inhabiting South Africa. I refer especially to a paper recently read by Mr. G. W. Smith (**10**). In this paper it is suggested that such forms as the freshwater Gammarids and Isopods or the genus *Lepidurus*, being essentially Crustacea preferring a temperate or cold climate, found their way to South America, and the Bassian subregion of Australia (Prof. Baldwin Spencer), by spreading along the Andes and thence to Australia by some lost Antarctic continental connection. Now no forms, typical of these said regions, have as yet been described from South Africa; no freshwater Gammarids or Isopods are known to occur; in the family Apodidæ, *Apus* alone is represented; among the Copepods we find rather a striking fauna: *Boeckella* is absent, and we find instead several genera some of which appear to be peculiar to South Africa; Crayfishes are absent from the spruits and rivers, the chief occupants appearing to be the river crabs and prawns. Of further interest is the great resemblance some of the forms found in the Transvaal bear to their European representatives; in all cases where possible, their points of resemblance to particular European forms have been mentioned; it is also interesting that *Daphnia pulex*, which was found in a dam near Pretoria, is in nearly every detail similar to the *Daphnia pulex* of European waters (*vide* Pl. XV. fig. 40).

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* I am indebted to Mr. G. A. Boulenger, F.R.S., for the identification of this fish.

† R. Moniez (**5**) first alluded to male Ostracods in Algeria appearing regularly amongst those forms which in Europe propagate their species parthenogenetically.

But to return for a moment to the Copepods. Including the *Metadiaptomus* of this paper, in all, four genera peculiar to South Africa have been determined. Of these the dominant genus *Broteas* (=*Lovênula*) appears to be the most widely distributed. Moreover, several species of *Diaptomus* have been described from South Africa, notably by Mrázek (6) from German West Africa. The genus *Metadiaptomus* resembles *Adiaptomus*, described by A. W. Cooper (2), in that the antennule possesses twenty-six segments instead of twenty-five as in *Diaptomus*; but a glance at Pl. XVI. fig. 46 *a*, and Pl. XVIII. fig. 55, will show two further peculiarities: (1) in that the antennal region of the thorax appears to be distinctly divided from the rest of the body; and (2) in the marked difference in the structure of the modified sixth pair of thoracic appendages from that of *Diaptomus*, especially in the male (*vide* text-fig. 11 *b*, p. 162).

Summing up the question of distribution here discussed, it might be said briefly: (1) that the Entomostraca here described show no relation whatever to Crustacea from the Bassian Region of Australia: (2) that they do show a certain approach, in some cases a marked resemblance, to European forms; (3) that, further, they have been evolved to a certain extent along lines of their own, showing considerable modifications which are not paralleled elsewhere.

In conclusion I take this as an opportunity of expressing my gratitude to Dr. Gunning, of the Transvaal Museum, for his kind assistance and advice; and to Mr. G. W. Smith, who just before I left England suggested Lake Chrissie as likely to yield some interesting results, for the help and encouragement he has given me in preparing the following descriptions; and I feel, if there is anything in this paper of interest or value, it is due to his suggestions.

Order OSTRACODA.

Family CYPRIDÆ.

The classification of G. W. Müller (7) has been adopted for assigning to the Ostracods here described their systematic position. They are all five undoubtedly Cyprids having eight-segmented antennules which are provided with long and slender hairs. However, it has not been without some hesitation that they have all been placed in the genus *Cypris*. Müller gives as characteristic for this genus, that the third biting process of the maxillula has two claw-like bristles distinct from the others which may or may not be toothed (p. 51). This is so in the cases of *Cypris gunningi*, *C. chrissiensis*, and *C. mastigophora*, and possibly of *C. tuberculata*; but although the maxillula of *C. spinosa* possesses these toothed bristles, it has, in addition, two small ones of similar character. It was not considered expedient to create another genus for this species on that character and others mentioned below, nor yet a new sub-genus, so it has been placed temporarily in the genus *Cypris*.

As to the common relationship of these five species, it will be seen that whereas *C. gunningi* and *C. chrissiensis* are closely connected one with the other, *C. spinosa* and *C. tuberculata* are aberrant, chiefly in the characters of the shell and of the maxillula. *C. mastigophora* undoubtedly conforms in many particulars to the subgenus *Cypridopsis*.

Besides the new species, *Cypris venusta* (Vávra, *loc. cit.*) was found fairly plentifully in Lake Chrissie; the most notable feature of this Cyprid is the presence of peculiar marginal denticulations on the shell.

Genus Cypris O. F. Muller.

Cypris spinosa, sp. n. (Plates VIII., IX. & X. figs. 9-12.)

Length 3·3 mm.; breadth 2·52 mm.; height 2·05 mm.

External appearance: from the dorsal aspect, the shape of the body is roughly quadrilateral, the ventral margins of the shell being expanded horizontally into wings. From the dorsal posterior region of each shell spring two long stout spines directed backwards. The anterior dorsal border of each valve is furnished with eight small spines; between the fourth and last spines are regular groups of bristles. The lateral expanded wings of the valves are much flattened and are produced along their posterior border into four or five spine-like processes; on the rounded surface of each shell there are two small prominences present.

The general colour is mottled umber; specimens found in Lake Chrissie were greenish.

Appendages.—The eight-jointed antennule resembles that of a typical *Cypris*.

The antenna consists of four joints: the second joint is furnished with five long swimming-hairs which reach to the end of the claws; the claws are longer than the terminal segments; just behind the claws are found three fine bristles. The second joint is provided dorsally and ventrally with rows of small fine hairs which vary somewhat in size and arrangement.

The mandible resembles very closely that of *Eurycypris pubera* as described by Claus (1).

The maxillula consists of a branchial appendage, a palp, and three biting processes. The branchial plate is provided with twenty-eight plumose rays. The palp is two-jointed; the distal joint bears five smooth bristles, and the proximal joint one short and six long bristles, also smooth. The third biting process carries terminally two simple bristles and two large and two smaller foliaceous setæ; subterminally there are three plumose bristles and a short smooth one. The second biting process carries terminally nine bristles, some simple, some plumose, and two foliaceous setæ. The first biting process is provided with seven bristles, some of which are simple, the others plumose, and in addition three foliaceous setæ.

The maxilla is precisely similar to that of *Eurycypris pubera* figured by Claus except for the presence of an inconspicuous group of hairs midway between the endopodite and the biting process. The clasping organ attached to this appendage in the male consists of a straight proximal and a curved terminal segment; on the inner side and situated at the distal base of the former piece are two spines, one considerably larger than the other, and the terminal segment ends in a sharp spine. The structure of this clasping organ is different on each side; on one side the proximal joint is shorter, and the distal joint which is sharply recurved is slenderer than is the case in the opposed portion. On the other side the distal joint is stout and sharply recurved.

The fourth post-oral limb resembles that of the subgenus *Eurycypris* in having the second and third segments fused, the internal border of the first joint bearing groups of short bristles which appear to spring from peculiar chitinous thickenings. The terminal serrated claw is somewhat longer than the fused second and third joints, and at its base springs a short serrated spine with a V-shaped base.

The fifth post-oral limb, the cleaning-foot, closely resembles that of *Eurycypris pubera*.

The caudal rami are a pair of slender, slightly curved rods, each carrying terminally a serrated seta which is twice as long as the outer seta inserted just proximal to its base; this latter is also serrated. They resemble closely those of *Eurycypris pubera*.

The copulatory organ of the male resembles in general shape that of *Cyprinotus incongruens* described by Müller. The outer branch of the outer process is foot-shaped, the inner branch being in the form of a curved spine; the outer border has a large projection to receive the coils of the vas deferens.

Locality. I obtained a great number of specimens in the littoral water of a small reed-pan near Chrissie and found two or three specimens in Lake Chrissie itself.

Remarks.—This species is remarkable in the peculiar shape of the shell and especially in the presence of the remarkable spinous processes which have been described.

The large size of this species is also to be noted. The appendages agree closely with the genus *Cypris* and especially with the subgenus *Eurycypris*; from this subgenus it differs in certain characters, the most important of which is the presence of a greater number of foliaceous setæ on the biting processes of the maxilla. *C. puberoides* as described by Vávra (*loc. cit.*) from German South-West Africa, is not unlike this species, chiefly in the character of the flattened shell, the penis and copulatory styles of the maxilla, and in the character of the antenna, which carries five claws.

Cypris gunningi, sp. n. (Pl. X. fig. 13; Pl. XI. figs. 14*a*, *b*, 15*a–c*, 17; Pl. XII.; Pl. XIII. figs. 23*a*, *b*; Pl. XV. fig. 36.)

Length 1·30 mm.; height, greatest ·74 mm., at centre ·68 mm.

External appearance: a lateral view of this animal shows it to be considerably longer than deep, the ratio of the length to the depth being as 2 : 1. The whole surface of the bivalve shell is covered with hairs of moderate length; they are longest on the ventral marginal edge, becoming shorter near and disappearing on the hinge-line; on the ventral inner margin of the shell, denticulations are present, which become very minute as they approach the dorsal hinge-line; these denticulations do not project beyond the outer margin of the shell.

Appendages. The antennule is typical of the genus *Cypris*.

The antenna has the terminal segment considerably thinner than in the foregoing species and the number and length of the setæ and hairs differ slightly; but two important distinctions are found on the second segment: (1) the swimming-hairs project considerably beyond the claws, a characteristic of the subgenus *Cypridopsis*; (2) a row of movable (?) denticulations is developed on that part of the distal marginal edge of the second segment which is opposed to the proximal portion of the third joint (Pl. XI. fig. 14*b*). The exact function of these tooth-like processes is not perhaps at once clear; but it may be, that being so placed in conjunction with the distal segment they serve the purpose of locking the second and third segments together in a straight line, thus strengthening the whole appendage for swimming. It is to be noticed that when the appendage is flexed at this point, the denticulations are flexed also. When, however, the third joint is flexed back into a straight line with the second, these processes would be brought up into the same straight line and so form a strong support to the two segments or actually lock them together.

The mandible is stouter than in *C. spinosa*; the two stout hairs on the inner part of the gnathobase are much shorter. The palp differs slightly in that the setæ on the terminal segment are not serrated, the stout plumose setæ on the fourth segment are much shorter, and the palp futhermore differs from that of *C. spinosa* in the number and character of the setæ on the inner margin of the first and second segments.

The maxillula: the forward-directed palp bears six fairly long bristles, two of which are plumose and one short. The distal joint bears three large and three small bristles, besides a number of hairs set close behind the base of the bristles, and one stout hair on the inner margin. The third biting process is peculiar. Besides the normal foliaceous setæ and bristles characteristic of the genus, the process is provided with a short seta which is armed with a number of hairs springing from its distal extremity and set at right angles to this seta: close but external to this structure is another seta considerably larger and thicker whence spring several short bristles. The other two biting processes, which are without the foliaceous structures found in *C. spinosa*, bear a number of stout smooth bristles.

The maxilla: the exopodite has fourteen plumose hairs as against thirteen present in *C. spinosa*; the plumose median seta of the endopodite is very long. The male accessory copulatory processes are, on the whole, stout; the distal joint of each differs considerably, one being slender, the other pear-shaped.

The fourth post-oral appendage: the third segment distinctly consists of two pieces; two rows of minute bristles border the distal margin of the fourth and fifth segments; the arrangement of the terminal setæ of the fourth segment differs from that found in *C. spinosa.*

The fifth post-oral appendage: the median seta of the third segment is longer than in *C. spinosa*; otherwise similar.

The caudal furca: the rami are generally stouter than in *C. spinosa*; distally a double row of serrations are borne along half their lengths; the two large distal processes on each ramus are relatively stout and short.

Locality. Found abundantly in littoral water of Lake Chrissie.

CYPRIS CHRISSIENSIS, sp. n. (Pl. XI. fig. 16; Pl. XIV. figs. 34, 35; Pl. XV. fig. 37.)

Length ·73 mm.; height ·44 mm. External appearance: in proportion to its depth this species is not so long as *C. gunningi*, the ratio of length to depth being as 1·7 : 1; correlated with this comparative decrease in length or increase in depth are two factors, namely, that the convexity of the dorsal surface of the body and a concavity in the ventral margins of the shell are more evident. In nearly all other respects this species resembles *C. gunningi.* It also bears a great resemblance to *Cyprinotus congener* (Vávra, *loc. cit.*), especially in the character of the accessory copulatory processes of the maxillæ. The general shape of the body and of the gnathobase of the mandible, and the structure of the accessory maxillary copulatory organs, are sufficient evidence that this is not a young form of *C. gunningi*; further, more than one female was found with ripe ova and introduced spermatophores, which leaves no doubt on the subject.

Appendages.—All the appendages are similar to those of *C. chrissiensis* except the following:—

The mandible, which is somewhat slimmer.

The fifth post-oral appendage: the terminal bristle is as long as the third segment. The median seta of the third segment and terminal seta of the second segment are short as in *C. mastigophora.*

The maxillary accessory copulatory structures are longer and thinner than in *C. gunningi.* The basal joint of one is very thick and stout, but of the other thin and long.

CYPRIS MASTIGOPHORA, sp. n. (Pl. XI. fig. 18; Pl. XIV. figs. 31, 32; Pl. XV. fig. 38.)

Length ·52 mm.; height ·25 mm. External appearance: viewed from the side the ratio of the length to the depth is roughly as 2 : 1. The hind-end tapers considerably; the fore-part ends bluntly. Fairly long hairs cover the surface and margins of the shell; denticulations are absent.

Appendages. The antennule is typical of the genus *Cypris.*

The antenna: the swimming hairs extend beyond the claws.

The mandible: the disposition and number of setæ and bristles on the palp are different from such as are found in the foregoing species. The terminal joint bears two large stout bristles and one small seta; the third segment is furnished with one large plumose bristle, and four setæ, three plumose, on the inner margin; on the external surface one short and three long setæ, and a group of hairs just behind these structures. The third segment of the palp bears on the external margin two long smooth setæ, and on the internal margin five stout pectinose bristles. The second segment is provided on the internal surface with three thick bristles, two of which are pectinose.

The maxillula: the terminal bristles of the palp are stouter than in *C. gunningi.* On the third biting process, in addition to the two foliaceous bristles, a number of fine setæ are developed below the extremity. Foliaceous bristles on the other biting processes are absent.

The maxilla does not differ from *C. gunningi.*

The fourth post-oral appendage: the third segment consists of two pieces; the appendage is practically similar to that of *C. gunningi,* except for the presence of additional setæ at the terminal end of the fifth segment and in the arrangement of some minute hairs about the second segment.

The fifth post-oral appendage: the median seta on the third and the end seta on the second segment are much shorter than in *C. spinosa*; otherwise similar in structure.

The caudal furca differs from that of any of the other Cypridæ described here in that the rami consist of long thin whip-like processes with one short seta at the base, a character peculiar to the subgenus *Cypridopsis.*

Remarks.—This species was comparatively rare; unfortunately no males were taken. It was found with the other Cypridæ in Lake Chrissie in the shallow marginal parts of the lake.

CYPRIS TUBERCULATA, sp. n. (Pl. XIII. figs. 24–28, & Pl. XIV. figs. 29, 30, 33.)

Length 1·9 mm. Height, anterior portion 1·65 mm., central 1·50 mm., and posterior 1·53 mm. External appearance: the shell has rather an exceptional appearance. It is covered with tubercles and short spines; the arrangement of these processes in no way resembles that found in *C. spinosa*; moreover, those parts not bearing tubercles or spines have everywhere small indentations, giving the appearance of beaten copper. The fore-part of the shell bears a few hairs irregularly arranged. The marginal edge is provided with hairs along most of its length. From the side, the outline of the shell is seen to have a slight anterior prolongation.

Appendages.—The antennule is typical of the family Cypridæ.

The antenna: the swimming-hairs do not extend beyond the bristles of the distal segment. The arrangement of the minute hairs on the second and third joints resembles that found in *C. spinosa*, but differs chiefly in the absence of hairs just behind the basal attachment of the swimming process on the second joint. Denticulations, as in *C. gunningi*, found on third joint. Distally only three curved serrated setæ are present.

The mandibles: an external serrated seta is present on the gnathobase; a comb-like structure is found on one of the external biting lobes of the same. The palp is provided with a very strong plumose bristle which is conspicuously larger than any of the other bristles and seta which it has in addition; the structure as a whole bears most resemblance to that of *C. gunningi*.

The maxillula from the point of view of classification is of most importance, in that no foliaceous hairs are present on the biting processes, although the two large bristles characteristic of the genus are present. The first biting process is provided roughly with a dozen and a half bristles, all smooth save two which are longer than the rest and serrated; at the basal extremity on the inner surface of this process arise two hairy bristles. The second biting process does not differ much from the first; but the long serrated bristles of the first are in this case absent. The third biting process is remarkable in possessing no foliaceous setæ. The two stout bristles shown in fig. 27 represent the foliaceous setæ found in the genus *Cypris*, the small grooves noticeable on these structures possibly indicating the remains of the reduced "pinnæ." This same character is also found in *C. virens* described and figured by Claus (1), but in this case the bristles are smooth. The palp resembles that of *C. gunningi*, the only difference between the two being that the short hair on the first segment is replaced by a longish one.

The maxilla: the exopodite is furnished with fifteen stout bristles; the first two bristles, which are short and thick, bear distally a number of small setæ; the third is large and hairy; the fourth and fifth are smooth; the sixth is short and serrated. Small hairs are found to cover the ventral surface and other parts of the appendage (Pl. XIII. fig. 28).

The fourth post-oral appendage: the third and fourth segments are distinct: the arrangement of bristles and hairs resembles that of *C. gunningi.*

The fifth post-oral appendage: the bristle and curved seta of the distal segment are comparatively long.

Each ramus of the caudal furca bears along nearly the whole of its inner edge a row of setæ and distally the four characteristic bristles.

Remarks.—This species was found not uncommonly, together with the other Ostracods described, in the shallow littoral water of Lake Chrissie.

Order CLADOCERA.

Family LYNCEIDÆ.

Genus LEYDIGIA Kurz.

LEYDIGIA TRISPINOSA, sp. n. (Pl. XVI. fig. 43.)

Length 1·27 mm.; height ·735 mm. This species resembles, in the general shape of the body and character of the telson, *Leydigia acanthocercoides* described by Lilljeborg (**3**) and figured on pl. lxxi. fig. 4. The head is small.

The posterior part of the carapace has the appearance of having been "pulled out" in a ventro-posterior direction; its ventral margin is provided with a row of stout hairs. The two large terminal spines of the telson are serrated; each bears at its base one small spine and a group of small hairs; anterior to these are eight pairs of fairly large stout spines; at the base of each arise two small ones of which the most internal is the smaller; the arrangement is therefore characteristically triple; in front of these spines, again, lie eight pairs of small spurs each with its group of setæ placed in an anterior position; slightly external to these, a row of fine setæ, which runs nearly the whole length of the body, is noticeable.

Locality. Shallow littoral water of Lake Chrissie.

Genus CHYDORUS Leach.

CHYDORUS CAROLINÆ, sp. n. (Pl. XVI. figs. 44 *a*, *b*.)

Length ·47 mm.; height ·37 mm. Body rotund; posterior angle distinct, without spine or process; the ventral margin of the shell has a fringe of spines; the rostrum, which is long and pointed, projects considerably beyond the end of both pairs of antennæ; no striations visible on the carapace; the arrangement of bristles on the telson is somewhat unusual.

Found in same locality as preceding species.

Family DAPHNIIDÆ.

Genus SIMOCEPHALUS Schœdler.

SIMOCEPHALUS CORNIGER, sp. n. (Pl. XV. fig. 41 & Pl. XVI. fig. 42.)

Length 2·34 mm.: height 1·76 mm. Body sub-ovate; head region defined from thorax by a dorsal notch; the shape of the body resembles that of *S. vetulus* described by Lilljeborg (*loc. cit.*) and figured on pl. xxiv. fig. 8; the ventral margin of the carapace is provided with a row of minute spines reaching backwards from near the head along a considerable portion of its length; through three quarters of this length but slightly internal to the row of spines, lies a line of closely-set stiff hairs; posterior to these structures, the carapace is furnished with a single row of short stout spines which reach almost as far as the posterior limit of the ventral margin of the body; they are smallest at the posterior region of the carapace. Nearly the whole surface of the body is covered with minute prickles. The carapace is striated (only a portion is shown striated in fig. 41).

The two large claws of the telson are serrated, and at the base of each lies a group of small setæ. Of the other spines the largest are curiously bent; each carries a group of setæ; further, groups of minute hairs, generally five or six to each group, are produced on the inner part of the telson; their limits are best realized on reference to fig. 42.

Locality. This species was found in Lake Chrissie, but occurs more abundantly in a little reed-pan three miles east of Chrissie.

Genus DAPHNIA O. F. Müller.

DAPHNIA PULEX. (Pl. XV. figs. 40 *a*-*c*.)

A few adult forms were found in Lake Chrissie, and a quantity of young in a dam near Erasmus' Farm, Pretoria. As already mentioned this *Daphnia* appears to be similar to the European form. There is one point in which it differs from *D. pulex*, but it is so insignificant, that it was not thought desirable to give this species specific distinction from *D. pulex*. The point is, that caudal styles and dorsal processes just in front, which project into the brood-chamber, are quite smooth. This South African form was not found to differ from the European representative in any other detail.

DAPHNIA GIBBA, sp. n. (Pl. XV. figs. 39 *a*, *b*.)

Length with tail 6 mm. Body rotund, but dorsal part of head and neck region enlarged to form a hump. Carapace striated. Tail, which is fairly long, covered with small spines which run a short way up the carapace and also ventrally extend along the margins of the carapace as far as the head.

The distal claws of the telson are pectinate, and are provided with small setæ. The pectinate processes are divided into three lots, each arranged in a semi-lunar form (*vide* fig. 39 *b*). Anterior to these claws, the telson is fringed by a number of stout bristles; internal to this fringe, along half its length, groups of minute setæ are found. On following the course of this fringe of bristles, it is found that they end gradually, passing internally into three or four rows. Still further, a number of minute setæ are found arranged in parallel tiers which run at right angles to the sagittal plane of the telson.

The caudal styles are partly plumose; the dorsal part of the telson extending from these styles, so as to include the finger-like processes which project into the brood-pouch, is hairy.

Locality. This striking and beautiful *Daphnia* was found fairly abundantly in Lake Chrissie and in some of the other larger pans.

Order COPEPODA.

In all, four species of Copepoda were taken. But it is an interesting fact that although the two species described below were found in great quantities, only one specimen of *Cyclops* and one specimen of Harpactid were taken. The latter may have easily been overlooked on account of its small size, but the scarcity of *Cyclops* is not a little remarkable. Unfortunately the *Cyclops* was not well enough preserved to allow identification.

Family CENTROPAGIDÆ.

Genus BROTEAS Lovén = *Lovénula* Schmeil.

BROTEAS FALCIFER Lovén = *Lovénula falcifera* Schmeil. (Pl. XVI. figs. 45 *a*, *b*.)

Length of male 4 mm.; of female 3·6 mm. In nearly every detail this species is identical with *Broteas falcifer* described by G. O. Sars (8) from the Cape Peninsula; a few points of structural difference are found: (1) in the length of the antennules, which when flexed back in line with the body reach as far as the proximal part of the caudal rami; (2) in the fact that the three outer bristles on the right furcal ramus in the male, instead of being smooth, as in the case of the species described and figured by G. O. Sars, are serrated on the inner side only in the case of the two internal and on each side in the case of the third bristle internal to these two; (3) in that the small fine bristle on each ramus, which occupies an internal position, slightly removed from the fringe of stout bristles, is somewhat longer than in *B. falcifer*. The caudal rami are asymmetrical.

It is considered that this Centropagid is no more than a local variety of the Cape form and has not therefore been given specific distinction.

Abundant in the larger pans.

Genus METADIAPTOMUS (gen. n.).

Diagnosis. Both antennules of female and left of male consist of twenty-six segments. Proliferation to form this *extra* joint has not apparently taken place in the same manner as in *Adiaptomus* judging from the explanation and figure given by A. W. Cooper (*loc. cit.*). In the sixth pair of thoracic limbs in the male, the exopodite of the right appendage is three-jointed; the basipodite is much enlarged on the internal surface to form a double cushion. The first joint of the two-jointed exopodite of the left leg carries a large curved claw, and distally two cushion-like processes are present. An endopodite to this left appendage appears to be wanting, but it may be present in a very reduced condition.

In other respects like the genus *Diaptomus.*

METADIAPTOMUS TRANSVAALENSIS, sp. n. (Pl. XVI. figs. 46 *a*-*c*, & Pls. XVII. & XVIII.)

Description of female.—Length of cephalothorax 1·25 mm.; of abdomen including furcal bristles ·7 mm.: of antennule 1·27 mm. Body subcylindrical, the greatest breadth at the junction of the third and fourth segments; the anterior portion of the body shaped like the nose of a bullet; the posterior part tapers slightly. The cephalothorax is composed of six distinct segments, the antennal region being distinctly divided from the rest of the body; the sixth segment bears projecting angular corners on its marginal lobes; these corners do not seem to represent another segment. The antennules when flexed back in line with the body do not extend beyond the limits of the cephalothorax. The abdomen consists of three distinct segments and the caudal rami.

Description of male.—Length of cephalothorax ·8 mm.; of abdomen, as for female, ·45 mm.; of left antennule ·86 mm. The great difference of size between the male and female is to be remarked upon. In general shape however and in its appendages it resembles the female. The abdomen consists of five segments and the caudal rami. The right antennule is geniculated.

Appendages.—The descriptions and drawings of the appendages have been taken in nearly all cases from females.

The antennules of the female and the left one of the male are made up of twenty-six distinct segments, a feature of *Adiaptomus* (see introduction p. 150). It is to be noticed, however, that whereas the proximal spine on the antennule of a female *Adiaptomus* occurs on the third segment, in that of *Metadiaptomus* it occurs on the second. From this evidence alone, it is concluded that proliferation to form this additional segment has not taken place in the same area or rather in the same way as in *Adiaptomus* as explained by A. W. Cooper (*loc. cit.* p. 101 and figs. 5, 5 *a*). Now, from the sudden change of length exhibited in segments twelve and thirteen, it is tentatively suggested that proliferation may have taken place from a segment once representing segments eleven and twelve (*vide* Pl. XVII. fig. 47). This explanation is put forward with all the more hesitation, seeing, first, that it may be merely superficial, and secondly, that the generally accepted view is, that proliferation takes place from the proximal segment, which is in this case together with the second segment admittedly short in comparison with that of the antennule of other Centropagidæ. Ten æsthetes were found on the female antennule (they are coloured blue in the figure). The spines from segment fifteen onwards are finely serrated. On segments three to nine marginal groups of small setæ are borne on the side other than that bearing spines and æsthetes: on the same side, and situated at the distal extremity of each segment from eight to thirteen, is a group of minute setæ. The male geniculated antennule consists of the normal twenty-three joints.

The antenna is very much like that of *Diaptomus castor* as figured by Schmeil (9): the exopodite consists of eight joints instead of seven; all the joints except the third and eighth bear one bristle each; the third joint has two bristles and the eighth is provided with three long distal hairs and a much shorter proximal: the terminal joint of the endopodite has two lobes, one bearing nine prominent setæ, the other seven and a few inconspicuous hairs marginally at the base of the long seta lying opposite the exopodite. A row of eight small hairs is placed distally near the external marginal edge of the second joint of the endopodite: the basipodite is provided internally with one stout bristle.

The mandible: the gnathobase is stout and broad at the base, but half-way between the basal tubercles and the point of insertion of the palp, there is a marked "neck." The basipodite of the palp bears four bristles, two setæ, one serrated and one smooth: the endopodite is two-jointed: a lobe is present on the proximal joint which bears four smooth bristles; the distal segment carries seven long smooth hairs: in addition, on the outer margin of this distal segment are developed small setæ which extend partly along the base of the terminal hairs. The exopodite appears to be four-jointed; the distal segment is to all appearances single, and bears three long hairs; the other segments each carry one long hair springing from the internal margin.

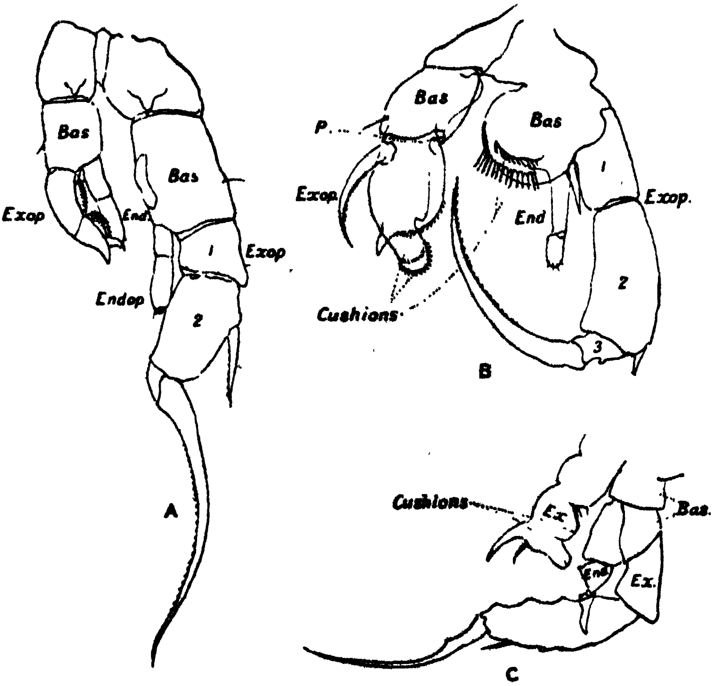
The maxillula (fig. 50) and maxilla (fig. 51) have nothing remarkable apart from what these appendages in *Diaptomus* possess. In the maxillula, the first endite of the first basal joint bears ten stout and three finer bristles; the second endite has four bristles; the third endite has three; the first exite is provided with nine large bristles and the second exite with one; the second basal joint and its endite together carry fourteen bristles.

The maxilla is very like that of *Diaptomus castor*, but the third and fourth exites have two bristles each instead of three, and the fifth exite has four bristles instead of three.

The first thoracic appendage or maxilliped is in the main like that of *D. castor* but is quite different from that of *Adiaptomus*. The second segment calls for special description. Distally, on the inner margin three bristles are found, of which the proximal is setaceous; between this bristle and the joint of the first and second segments there is a close-set row of fine stiff bristles, in the form of a long comb, placed just internal to the inner margin of the joint which is itself partly fringed with fine hairs; occupying the centre of the surface of this same segment is a mass of fine long hairs set in the long axis of the same and occupying about a third of its length.

The thoracic limbs (figs. 53 & 54) used for swimming are like those of a typical *Diaptomus*; but the modified sixth pair is sufficient to show the marked aberrancy of this species from *Diaptomus* or any other Centropagid genus described. For convenience sake, the sixth pair of thoracic appendages of the male of *Diaptomus castor*, of *Adiaptomus natalensis*, and of the new species now under discussion are here figured side by side for comparison, since it is thought that the character of these limbs is of the greatest importance for classification (*vide* text-fig. 11 *A*, *B*, *C*). The whole organ is seen to consist of a pair of asymmetrical limbs,

Text-fig. 11.



Sixth Thoracic Appendages of (A) *Diaptomus castor* (after Schmeil); (B) *Metadiaptomus*; (C) *Adiaptomus natalensis* (after Cooper). P. possibly indicates remains of endopodite.

the right considerably larger than the left and armed with a long terminal claw serrated on the inner side. This claw is borne by the exopodite, which consists of three segments; the distal one is small, bearing, besides the long claw, a small protuberance or knob on its outer margin; the second segment, which has a short spine terminally, is large; the endopodite is two-jointed; the distal joint is much shorter than the proximal and is armed with about four fine setæ terminally; between the endopodite and exopodite arises, apparently from the basipodite, a conspicuous thorn. The basipodite itself is somewhat peculiar; it has a rounded inner face bearing a double cushion, an inner part furnished with a row of short curved spines, and an outer part with a row of digitiform processes. Left limb: the distal basal joint bears a bristle on its external surface and in addition an exopodite, but no signs of a endopodite, unless a small knob on its inner edge be taken as the remains of such. The structure of the exopodite is not very clear; but the following points have been made out, namely: a long proximal curved claw serrated along its inner margin, a cushion with serrated margin which is produced externally and distally into a short curved spine, a second distal cushion smaller than the proximal one, bearing two rows of prickles.

In the female this pair of limbs is in the main like that of *Diaptomus*; however, the first basal joint has no spines; the second basal joint is as thick as it is long; both endopodite and exopodite are present: the endopodite consists of one joint only; internally it bears two very small spines some distance apart, and terminally two bristles: the exopodite is two-jointed; the distal segment carries two spines, and is produced into a serrated claw; the middle spine has further a small bristle and two or three minute hairs on its inner margin.

The caudal furca are asymmetrical in both sexes, the left one being longer in each case. Five stout plumose bristles are present, and one small slender one which is smooth.

Locality. Very abundant in Lake Chrissie and in the pans generally.

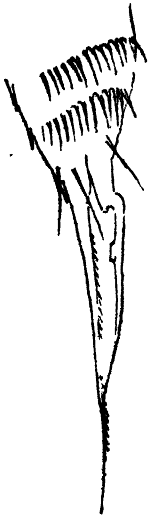
Family HARPACTICIDÆ.

Genus CANTHOCAMPTUS.

CANTHOCAMPTUS ?

The one specimen obtained, which was very small, was unfortunately lost in attempting to macerate it. However, before this happened, it had been determined that it belonged undoubtedly to the genus *Canthocamptus* and closely resembled *Canthocamptus finni*, as described and figured by Prof. G. C. Bourne (**2***a*) from the neighbourhood of Zanzibar. This specimen from Chrissie was a female and was remarkable in having asymmetrical caudal styles; a text-figure of these is inserted, and it will be seen that the right style is peculiarly bent and fashioned. This may be merely an abnormality, but the process was certainly intact. In the general shape, the animal was seen to be comparatively broad and short. The left caudal style was rather more than two-thirds as long as the body.

Text-fig. 12.



Posterior region of the body of *Canthocamptus*? seen from the right side, showing the two asymmetrical caudal styles.

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(2 *a*) Bourne, G. C.—"On two new species of Copepoda from Zanzibar." Proc. Zool. Soc. 1893, pp. 164–166, pl. vi.

(3) Lilljeborg.—Cladocera Sueciæ. Upsala, 1900.

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(10) Smith, G. W.—"The Fresh-water Crustacea of Tasmania, with Remarks on their Geographical Distribution." Trans. Linn. Soc. 2nd ser. Zool. vol. xi. pt. 4, June 1909.

(11) Vávra.—"Die Süsswasser-Ostracoden." Deutsch-Ost-Afrika, 4. 1898, Berlin.

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GIESBRECHT, W., & O. SCHMEIL.—Das Tierreich, 6 Lief. Berlin, 1898 (especially p. 67).

GURNEY, R.—"On a small collection of Entomostraca from South Africa." Proc. Zool. Soc. 1904, vol. ii. pp. 298–301, pl. xviii.

WELTNER, W.—"Die Cladoceren." Deutsch-Ost-Afrika, 4. 1898, Berlin.

For histology of soft parts, and especially of the spermatozoa of Ostracods, see G. O. Sars, "On some Freshwater Ostracoda and Copepoda, raised from dried Australian mud." Christiania Vid.-Selsk. Forhandl. 1889, No. 8.

EXPLANATION OF THE PLATES.

The appendages have been drawn with the aid of a Camera lucida, and in most cases the nature of the lenses used has been inserted in this explanation together with such reduction or magnification found to have been necessary for the reproduction of the same from the original drawings.

PLATE VIII.

All figures of *Cypris spinosa*, sp. n.

Fig. 1. Dorsal view of animal. × 20.
2. Lateral view of shell.
3. Antennule. aa. AD. 4. Zeiss, 3 eyepiece. × $\frac{1}{4}$.
4. Antenna. Ditto. × $\frac{3}{4}$.

PLATE IX.

All figures of *Cypris spinosa*, sp. n.

Fig. 5 *a*. Mandible. aa. AD. 4. Zeiss, 3 eyepiece. × $\frac{3}{4}$. 5 *b*. Terminal part of gnathobase. $\frac{1}{12}$ Zeiss, 2 eyepiece. × $\frac{3}{4}$.
6 *a*. Maxillula. 6 *b*. Part of typical seta of branchial appendage. 6 *c*. Palp. 6 *d*. Third biting process.
7. Maxilla.
8 *a* & 8 *b*. Accessory copulatory processes of maxilla. aa. Zeis, 4 eyepiece. × $\frac{3}{4}$.

PLATE X.

Fig 9. Fourth post-oral appendage of *C. spinosa*. aa. AD. 4 Zeiss, 4 eyepiece. × $\frac{3}{4}$.
10. Penis of male of same.
11. Fifth post-oral appendage of same. aa. AD. 4 Zeiss, 4 eyepiece. × $\frac{3}{4}$.
12. Caudal furca of same. aa. AD. 4 Zeiss, 3 eyepiece. × $\frac{3}{4}$.
13. Antennule of *C. gunningi*, sp. n.

PLATE XI.

Fig. 14 *a*. Antenna of *C. gunningi*. B. Zeiss, 2 eyepiece. × $\frac{3}{4}$.
14 *b*. Denticulations on second joint (*vide* p. 153).
15 *a*. Mandible of same. 15 *b*. Terminal part of gnathobase. 15 *c*. Palp.
16. *C. chrissiensis* in lateral view. AA. Zeiss, 2 eyepiece. × $\frac{1}{3}$.
17. *C. gunningi* in lateral view.
18. *C. mastigophora* in lateral view.

PLATE XII.

Fig. 19 *a*. Maxillula of *C. gunningi*. 19 *b*. Palp. 19 *c*. Third biting process.
20 *a*. Maxilla of same. 20 *b* & *c*. Accessory copulatory process of male.
21 *a*. Fourth post-oral appendage of same. 21 *b*. Internal terminal bristles of distal part of third joint.
22 *a* & 22 *b*. Fifth post-oral appendage of same.

Plate XIII.

Fig. 23 *a* & 23 *b*. Two views of a furcal ramus of *C. gunningi*.
24. Lateral view of *C. tuberculata*, sp. n. AD. aa. 6 Zeiss, 4 eyepiece. × ½.
25. Antenna of same. AD. aa. 6 Zeiss, 4 eyepiece. × ¾.
26 *a*. Gnathobase of mandible of same. AD. 6 D. Zeiss, 2 eyepiece. × ½.
26 *b*. Palp. AD. 6. Zeiss, 2 eyepiece.
27. Third biting process of maxillula of same. AD. 6. Zeiss, 4 eyepiece.
28. Maxilla of same.

Plate XIV.

Fig. 29. Fourth post-oral appendage of *C. tuberculata*. AD. aa. 6. Zeiss, 4 eyepiece. × ¾.
30. Terminal part of fifth post-oral appendage of same. AD. 6 D. Zeiss, 2 eyepiece. × ½.
31. Palp of mandible of *C. mastigophora*.
32. Third biting process of maxillula of same.
33. Furcal ramus of *C. tuberculata*. AD. aa. 6. Zeiss, 2 eyepiece. × ¾.
34 & 35. Accessory copulatory process of maxilla of *C. chrissiensis*. AD. 6 D. Zeiss, 2 eyepiece. × ¾.

Plate XV.

Fig. 36. Penis of male *C. gunningi*. DD. Zeiss, 2 eyepeice. × ½.
37. Penis of male *C. chrissiensis*. AD. 6 D. Zeiss, 2 eyepiece. ½.
38. Furcal ramus of *C. mastigophora*.
39 *a*. Lateral view of *Daphnia gibba*, sp. n. × 16.
39 *b*. Telson of same.
40 *a*. Lateral view of *Daphnia pulex*.
40 *b*. Lateral view of terminal part of head of same.
40 *c*. Telson of same.
41. Lateral view of *Simocephalus corniger*, sp. n.

Plate XVI.

Fig. 42 *a*. Telson of *S. corniger*. 42 *b*. Enlarged drawing of a spine.
43. Lateral view of *Leydigia trispinosa*, sp. n. × 60.
44 *a*. Lateral view of *Chydorus carolinæ*, sp. n. × about 100.
44 *b*. Telson of same.
45 *a*. Terminal portion of abdomen of male *Broteas falcifer* Sars.
45 *b*. Abdomen of female of same.
46 *a*. Lateral view of female *Metadiaptomus transvaalensis*, sp. n. × 46.
46 *b*. Abdomen of female. 46 *c*. Abdomen of male.

Plate XVII.

All figures of *Metadiaptomus transvaalensis*, sp. n.

Fig. 47. Antennule of female. AA. Zeiss, 4 eyepiece. × ¾. Æsthetes in blue.
48. Antenna. AA. Zeiss, 2 eyepiece.
49. Mandible. DD. Zeiss, 2 eyepiece. × ¾.
50. Maxillula. DD. Zeiss, 2 eyepiece. × ¾.

Plate XVIII.

All figures of *Metadiaptomus transvaalensis*, sp. n.

Fig. 51. Maxilla. DD. Zeiss, 2 eyepiece. × ¾.
52. Maxilliped. DD. Zeiss, 2 eyepiece. × ¾.
53. Second thoracic appendage. AA. Zeiss, 4 eyepiece.
54. Fifth thoracic appendage. AA. Zeiss, 4 eyepiece.
55 *a*. Sixth thoracic appendage of male. DD. Zeiss, 2 eyepiece. × ¾.
55 *b*. Sixth thoracic appendage of female. DD. Zeiss, 2 eyepiece. × ¾.

2. Littoral Marine Fauna: Kerimba Archipelago, Portuguese East Africa. Collected by James J. Simpson, M.A., B.Sc., University of Aberdeen, September 1907—May 1908: HOLOTHURIOIDEA. By JOSEPH PEARSON, D.Sc., F.L.S., Demonstrator and Assistant Lecturer in Zoology, University of Liverpool.*

[Received November 23, 1909.]

(Text-figures 13–17.)

I am indebted to Mr. James Simpson for the opportunity of making an examination of the Holothurians collected by him in Portuguese East Africa.

The collection consists of twenty-one species most of which do not offer any points of special interest. *Cucumaria turbinata* is recorded for the third time. It was first obtained by Hutton in New Zealand, who gave an unsatisfactory description of the species. Professor Herdman also obtained it from Ceylon, and a full account of the species was given by me in the report on the Ceylon Holothurians (**29**)†. The form described by Théel as *Colochirus violaceus* is represented by two specimens in the collection. For reasons which I shall give later, I think it necessary to establish a new genus for this species.

The following is a list of the species represented in the collection:—

Synapta grisea Semper.
Cucumaria semperi Bell.
Cucumaria turbinata Hutton.
Pseudocolochirus violaceus Théel.
Stichopus chloronotus Brandt.
Stichopus variegatus Semper.
Mülleria lecanora Jaeger.
Mülleria mauritiana Quoy & Gaimard.
Mülleria miliaris Quoy & Gaimard.
Holothuria albiventer Semper.
Holothuria atra Jaeger.
Holothuria atra, var. *amboinensis* Théel.
Holothuria curiosa Ludwig.
Holothuria dofleinii Augustin.
Holothuria impatiens Forskål.
Holothuria lineata Ludwig.
Holothuria marmorata Jaeger.
Holothuria martensii Semper.
Holothuria monacaria Lesson.
Holothuria scabra Jaeger.
Holothuria vagabunda Selenka.

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* Communicated by Prof. W. N. PARKER, Ph.D., F.Z.S.

† The numbers in brackets refer to the Bibliography, pp. 181 & 182.

List of Stations at which Holothurians were obtained.

STATION I. Tunghi Bay.
Bottom. Sand, mud, and shell. *Depth.* 5–18 fathoms.
Synapta grisea.
Holothuria marmorata.
H. albiventer.
H. scabra.
H. dofleinii.

STATION II. Maiyapa Bay.
Bottom. Sand, mud, and coral. *Depth.* 10 fathoms.
Pseudocolochirus violaceus.
Stichopus variegatus.
Mülleria lecanora.
Holothuria impatiens.
H. lineata.

STATION VI. Kero-Nyuni Bay.
Bottom. Sand. *Depth.* 5–10 fathoms.
Pseudocolochirus violaceus.
Holothuria albiventer.

STATION VII. Pekawi Bay. Exposed coral-reef.
Cucumaria semperi.
C. turbinata.
Holothuria albiventer.
H. squamifera.
H. monacaria.

STATION IX. Ibo Bay. Reefs around Matemo Is.
Stichopus chloronotus.
Mülleria mauritiana.
M. miliaris.
Holothuria impatiens.
H. atra.
H. vagabunda.
H. curiosa.
H. atra, var. *amboinensis.*

STATION XIII. Pemba Bay.
Bottom. Mud. *Depth.* 10–20 fathoms.
Holothuria albiventer.

SYNAPTA GRISEA Semper.

Synapta grisea Semper, 1868 (**11**); Ludwig, 1882 (**15**); Bell, 1884 (**17**); Théel, 1886 (**20**).

Two mutilated specimens from Station I. Tunghi Bay.

The colour in spirit is grey with a greenish tinge.

There are fourteen digitate tentacles, each being about 25 mm. long. Owing to the bad condition of the specimen it is difficult to say whether the digits of the tentacles are webbed.

There appears to be very little difference between *Synapta* *grisea* and *Synapta glabra*. The spicules and the calcareous ring are very similar in both species.

The calcareous ring consists of fifteen pieces. Each of the five radial pieces has a broad anterior prolongation which is perforated by a small hole. The ten inter-radial pieces are prolonged in front as short rod-like processes.

The spicules agree with Semper's figures.

Total length of anchor 315 μ.

Total length of anchor-plate 225 μ.

Diameter of miliary granules 15 μ.

General distribution. Bohol, Fitzroy Is., Queensland, Indian Ocean.

CUCUMARIA SEMPERI Bell.

Cucumaria semperi Bell, 1884 (**17**); Lampert, 1885 (**18**); Théel 1886 (**20**).

One specimen from Station VII. South of Pekawi. Length 45 mm.; breadth 15 mm.

There is nothing to add to previous descriptions and to my notes given in the report on the Mergui Holothurioidea.

General distribution. Port Denison, Torres Str., Mergui.

CUCUMARIA TURBINATA Hutton.

Labidodesmus turbinata Hutton, 1878 (**13**).
Cucumaria turbinata Lampert, 1885 (**18**).
(?) *Cucumaria* (*Labidodesmus*) *turbinata* Théel, 1886 (**20**).
Cucumaria (?) *turbinata* Dendy, 1897 (**27**).
Cucumaria turbinata Pearson, 1903 (**29**).

One specimen from Station VII. South of Pekawi. Length 48 mm.; breadth 13 mm.

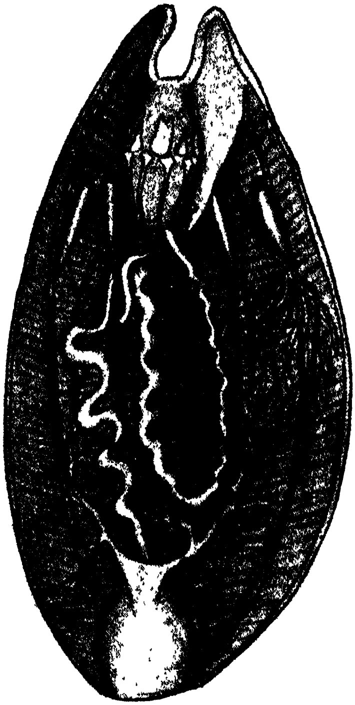
I have already given a full description of this species in the report on the Ceylon Holothurioidea (**29**). In the present specimen the body has not the same shape as in the Ceylon specimen. It is evidently in a contracted condition so that the tapering anterior end which was characteristic of the Ceylon specimen is not shown.

The whole of the body has a brown colour. The pedicels are black and are arranged in five double rows at both ends of the body. In the central region the tube-feet also spread over the inter-ambulacra and are more numerous on the ventral surface.

The tentacles are absent. There is one Polian vesicle and the stone-canal. There are two respiratory trees (see text-fig. 13, p. 170).

In addition to the deposits in the general integument which have been already described in the Ceylon Report, there are well-developed tables in the pedicels. These tables are long and narrow and are prolonged into two arms (text-fig. 14 A, p. 171). In the centre are four holes and at the end of each arm there are two or three holes (text-fig. 14 B). From the centre of the table arises a short tower having one cross-beam and being surmounted by a few teeth. In addition to these tables there are a few perforated plates (text-fig. 14 C) and also numerous miliary granules similar to those present in *Synapta* (text-fig. 14 D).

Text-fig. 13.



Cucumaria turbinata, showing internal organs. × 2.

Size of crosses in general integument—length 67 μ; breadth 11 μ. Miliary granules 26 μ.

Size of tables in pedicels—length 166 μ; greatest width 44 μ; height of tower on table about 50 μ.

The perforated plates are about the same length as the tables.

General distribution. Stewart Is., New Zealand, Ceylon.

PSEUDOCOLOCHIRUS VIOLACEUS Théel.

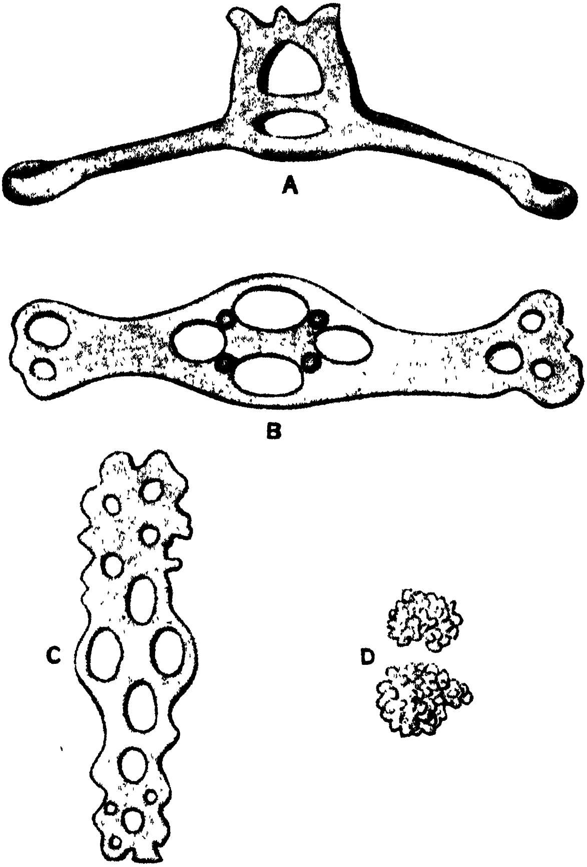
Colochirus violaceus Théel, 1886 (**20**); Koehler, 1895 (**26**); Koehler & Vaney, 1908 (**31**).

One specimen from Station II. Maiyapa Bay.
Length 85 mm.; breadth 48 mm.

One specimen from Station VI. Kero-Nyuni Bay.
Length 95 mm.; breadth 50 mm.

The specimen from Station II. is white. That from Station VI.

Text-fig. 14.



Cucumaria turbinata.

A. Table with tower (side view). × 450.
B. Table with tower (plan). × 450.
C. Perforated plate. × 320.
D. Miliary granules. × 460.

is violet-coloured on the interambulacra and white on the ambulacra. When the latter specimen first came into my hands the colouring was very decided, but in the course of a few months the colour has almost entirely disappeared, owing probably to the action of light and the effect of the preservative.

Externally the specimens agree with Théel's description. There are no pedicels on the bivium and those on the trivium are confined to three definite rows. Very few papillæ are shown in the specimens under examination. In the 'Challenger' specimen the papillæ were very obvious.

There are nine arborescent tentacles in the larger specimen and ten in the other specimen. All the tentacles are about the same size.

There are five ill-defined calcareous teeth around the anus. The calcareous ring has no posterior prolongations. There is one large Polian vesicle—28 mm. long—and one stone-canal. There are five well-developed retractor muscles extending from the calcareous ring to the body-wall. They are attached to the latter about half-way down the body. The respiratory trees are well developed. The alimentary canal is large and the reproductive organs are very large and consist of two bundles.

Théel gives drawings of the whole animal, of the spicules and the calcareous ring.

The spicules are few in number and agree with Théel's figures. Length of buttons 63 μ; breadth 55 μ.

As Théel and Koehler have pointed out, this species differs in a marked manner from the other species of the genus *Colochirus*.

After a careful examination I have decided to establish a new genus for this form. Undoubtedly it does not possess any of the outstanding features of the genus *Colochirus*. The body is not quadrangular; the anterior and posterior ends of the body are not pentagonal; the mouth is not surrounded by five valves; and the two ventral tentacles are not smaller than the rest. The deposits are few in number and unlike those of *Colochirus*.

It agrees with *Colochirus* (1) in having three rows of pedicels on the trivium and only papillæ on the bivium, (2) in being a Dendrochirote having a calcareous ring without posterior prolongation.

General distribution. 'Challenger' St. 203, 11° 6′ N., 123° 9′ E. Indian Ocean.

The characters of the new genus may be summarised as follows:—

Pseudocolochirus, gen. n.

Body cucumiform. Pedicels present only on the trivium where they are arranged in three well defined rows. Small papillæ scattered on the bivium. A few also on the trivium. Ten arborescent tentacles of equal size. The anus is surrounded by five calcareous teeth. The perisome is thick but is not strengthened by many deposits. The spicules are few in number and consist of small perforated buttons. The calcareous ring is devoid of posterior prolongations and has five well developed retractor muscles.

Stichopus chloronotus Brandt.

Stichopus chloronotus (subgenus *Perideris*), Brandt, 1835 (6).
Stichopus chloronotus Selenka, 1867 (10).
Stichopus cylindricus Haacke, 1880 (14).
Stichopus chloronotus Ludwig, 1882 (15); Lampert, 1885 (1

Bell, 1886 (**19**); Théel, 1886 (**20**); Ludwig, 1887 (**23**); Sluiter, 1887 (**24**), 1901 (**28**); Pearson, 1903 (**29**); Koehler & Vaney, 1908 (**31**).

Two specimens from Station IX. Matemo Is.

Length 120 mm. and 140 mm.

Width 30 mm. and 42 mm.

The respiratory trees are well developed, extending almost the entire length of the body. The gonads extend to the posterior end of the body. There are no Cuvierian organs. There are twenty tentacles.

Deposits typical.

Diameter of tables 33·3 μ.

Height of spine of table 33·3 μ.

Length of C-shaped deposits 37 μ.

General distribution. Pacific Islands, Indian Ocean from East Africa to the Malay Peninsula.

STICHOPUS VARIEGATUS Semper.

Stichopus variegatus Semper, 1868 (**11**).

Stichopus variegatus, var. *herrmanni* Semper, 1868 (**11**).

Stichopus nasso Haacke, 1880 (**14**).

Stichopus variegatus Bell, 1884 (**17**); Lampert, 1885 (**18**); Théel, 1886 (**20**); Ludwig, 1887 (**23**); Sluiter, 1887 (**24**), 1901 (**28**); Pearson, 1903 (**29**); Koehler & Vaney, 1908 (**31**).

One specimen in bad condition from Station II. Maiyapa Bay. Length 80 mm.

The specimen undoubtedly belongs to the above species but is much flattened and distorted.

The deposits are typical.

Diameter of tables 29·6 μ.

Height of spire of table 29·6 μ.

C-shaped deposits, length 166·5 μ.

Length of dichotomous rods 15 μ.

General distribution. Indo-Pacific, East Indies.

MÜLLERIA LECANORA Jaeger.

Mülleria lecanora Jaeger, 1833 (**3**).

Holothuria dubia (subgenus *Microthele*), Brandt, 1835 (**6**).

Actinopyga lecanora Bronn, 1860 (**9**).

Mülleria lecanora Semper, 1868 (**11**); Lampert, 1885 (**18**); Théel, 1886 (**20**); Sluiter, 1901 (**28**); Koehler & Vaney, 1908 (**31**).

Two specimens from Station II. Maiyapa Bay.

Length 145 mm. and 125 mm.

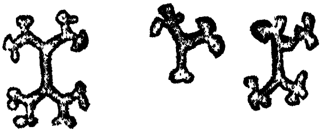
Breadth 80 mm. and 70 mm.

The specimens are dark brown on the dorsal side and lighter on the ventral surface. There is a light patch around the anus. The pedicels are scattered over the trivium but are more densely aggregated on the three ambulacra. The papillæ on the dorsal surface are small.

There are three polian vesicles, their respective lengths being 26 mm., 10 mm., and 6 mm. There is one madreporite.

The twenty tentacular ampullæ are extremely long—30 mm.

Text-fig. 15.



Mülleria lecanora. Spicules. × 550.

Both the respiratory trees are well developed.

The dichotomous rods occur in groups, each rod has a length of 26 μ (text-fig. 15).

General distribution. Philippines, Celebes, Bonin Is., Timor, Mauritius, Fiji Is., Indian Ocean.

MÜLLERIA MAURITIANA Quoy & Gaimard.

Holothuria mauritiana Quoy & Gaimard, 1833 (**4**).

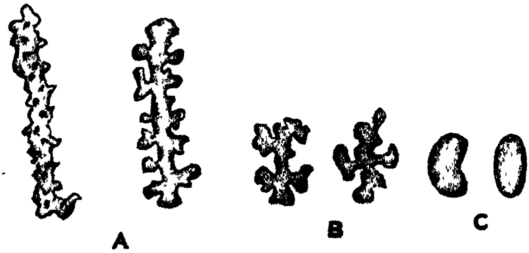
Mülleria varians Selenka, 1867 (**10**).

Mülleria mauritiana Semper, 1868 (**11**); Lampert, 1885 (**18**); Théel, 1886 (**20**); Sluiter, 1867 (**24**), 1901 (**28**).

Actinopyga mauritiana Bell, 1887 (**22**); Pearson, 1903 (**29**).

Mülleria mauritiana Koehler & Vaney, 1908 (**31**).

Text-fig. 16.



Mulleria mauritiana. Various forms of spicules.

A. Spinous rods in dorsal integument. × 430.
B. "Rosettes" in dorsal integument. × 450.
C. Spherical bodies in ventral integument. × 430.

One specimen from Station IX. Matemo Is.

Length 175 mm.; breadth 60 mm.

As in the Ceylon specimen examined by me, there is a well-defined white patch on the ventral surface The deposits are similar to those described by Théel. Those of the ventral surface consist of large numbers of spherical bodies.

Length of spinous rods in dorsal integument 63 μ (text-fig. 16 A).

Length of rosettes in dorsal integument 22 μ (text-fig. 16 B).

Length of spherical bodies in the ventral integument 18·5 μ (text-fig. 16 C).

Width of spherical bodies in the ventral integument 11 μ.

General distribution. Indian Ocean from E. Africa to the East Indies; Funafuti.

MÜLLERIA MILIARIS Quoy & Gaimard.

Holothuria miliaris Quoy & Gaimard, 1833 (**4**).

Holothuria lineolata Quoy & Gaimard, 1833 (**4**).

Mülleria lineolata Brandt, 1835 (**6**).

Mülleria plebeja Selenka, 1867 (**10**).

Mülleria miliaris Semper, 1868 (**11**); Lampert, 1885 (**18**); Théel, 1886 (**20**).

Muelleria miliaris Bell, 1887 (**21**).

Actinopyga miliaris Bell, 1887 (**22**).

Mülleria miliaris Ludwig, 1887 (**23**); Sluiter, 1887 (**24**), 1901 (**28**); Koehler & Vaney, 1908 (**31**).

Two specimens from Station IX. Matemo Is.

Length 90 mm. and 125 mm.

Breadth 35 mm. and 45 mm.

The body is wrinkled and much contracted. The pedicels are arranged in three indefinite rows on the ventral surface. The papillæ are scattered over the dorsal surface. There are twenty tentacles and a similar number of long tentacular ampullæ. The calcareous ring consists of ten simple pieces. The body has well developed circular muscles and there are five rows of longitudinal muscles, each row being double. The deposits are typical. The dichotomous rods vary in shape and size.

Minimum length of rods 7·4 μ.

Maximum length of rods 44·4 μ.

General distribution. East coast of Africa, Indian Ocean, Red Sea, Sumatra, Fiji Is.

HOLOTHURIA ALBIVENTER Semper.

Holothuria albiventer Semper, 1868 (**11**); Lampert, 1885 (**18**); Théel, 1886 (**20**); Sluiter, 1901 (**28**).

Six specimens altogether.

	Length.	*Breadth.*
Tunghi Bay. Station I.	70 mm.	23 mm.
	85 mm.	30 mm.
Nero-Nyuni Bay. St. VI.	40 mm.	20 mm.
Pekawi Bay. St. VII.	85 mm.	35 mm.
Pemba Bay. St. XIII.	70 mm.	17 mm.
	45 mm.	23 mm.

Colour. The dorsal surface is brown with a few large dark brown spots. The ventral surface is lighter and each papilla is surrounded by a white patch. All the papillæ are white.

The anterior end of the body is blunt and the body tapers towards the posterior end. Papillæ are present all over the body, those on the dorsal surface being smaller than the ventral ones. The mouth is surrounded by a ring of digitate papillæ.

The circular muscles of the body-wall are poorly developed.

There is one Polian vesicle and a long madreporite as described by Théel. The calcareous ring agrees with Théel's description.

The deposits consist of tables and buttons.

Diameter of tables 55·5 μ.

Height of spire on tables 37 μ.

Length of buttons 29·5 μ.

General distribution. Philippines, Amboina, Red Sea, Labuan, Pacific.

HOLOTHURIA ATRA Jaeger.

Holothuria atra Jaeger, 1833 (**3**).

Holothuria (subgenus *Microthele*) *affinis* Brandt, 1835 (**6**).

Holothuria floridana Pourtalés, 1851 (**8**); Selenka, 1867 (**10**).

Holothuria atra Selenka, 1867 (**10**).

Holothuria amboinensis Semper, 1868 (**11**).

Holothuria atra Semper, 1868 (**11**); Théel, 1886 (**20**); Bell, 1886 (**19**), 1887 (**22**).

Holothuria atra, var. *amboinensis* Théel, 1886 (**20**).

Holothuria atra Sluiter, 1887 (**24**), 1901 (**28**); Ludwig, 1887 (**23**); Pearson, 1903 (**29**); Koehler & Vaney, 1908 (**31**).

One specimen from Station IX, Matemo Is. Length 115 mm.; breadth 35 mm.

This species is characterised by having numerous Polian vesicles and madreporic canals. The numbers vary in different individuals. In the specimen under examination there are four Polian vesicles and twelve stone-canals.

The deposits are typical.

Width of table 22 μ. Height of spine on table 52 μ.

Average length of perforated plates 44·5 μ.

General distribution. Celebes, Florida, Red Sea and Indian Ocean, East Indies, Pacific Islands.

HOLOTHURIA ATRA, var. AMBOINENSIS Théel.

Holothuria atra Selenka, 1867 (**10**).

Holothuria amboinensis Semper, 1868 (**11**).

Holothuria atra, var. *amboinensis* Théel, 1886 (**20**).

Two specimens from Station IX. Matemo Is.

Length 130 mm. and 125 mm.

Breadth 30 mm. and 30 mm.

Both specimens are black.

These specimens resemble *Holothuria atra* very closely except in colour. There are some small points of difference in the spicules.

The tables have a larger base than in *H. atra* and have generally a few small peripheral holes. The edge of the base is often spinous. Fenestrated plates similar to those in *H. atra* are rare, but there are numerous small rods which branch dichotomously and which may represent stages in the disintegration of larger fenestrated plates.

Diameter of tables 44·5 μ.

Length of branched rods 11 μ.

There are numerous Polian vesicles and stone canals as in *H. atra.*

General distribution. Amboina, Venezuela, East Africa.

HOLOTHURIA CURIOSA Ludwig.

Holothuria curiosa Ludwig, 1875 (**12**); Lampert, 1885 (**18**); Théel, 1886 (**20**); Sluiter, 1901 (**28**).

One specimen from Station IX. Matemo Is.

Length 32 mm.; breadth 12 mm.

The colour of this specimen does not agree with Théel's description of the species. The dorsal surface is dark brown over which are scattered numerous yellow spots. The ventral surface is much lighter. There is a small light area around each end of the body.

This specimen resembles *Holothuria curiosa* very closely in most respects. The deposits are very similar to those described by Théel. The tables in most cases have rudimentary spires, but in a few instances complete spires are present consisting of four upright rods surmounted by a spinous ring.

Diameter of tables from 37 μ to 48 μ.

Length of buttons 41 μ.

General distribution. Bowen, Fiji, New Guinea, Philippines, Indian Ocean.

HOLOTHURIA DOFLEINII Augustin.

Holothuria dofleinii Augustin, 1908 (**30**).

One specimen (much flattened) from Station I. Tunghi Bay.

Length 85 mm.

I have no hesitation in placing this specimen in Augustin's species.

The colour of the body is yellowish white. The papillæ have a brown colour and there is a dark brown ring around the base of each papilla.

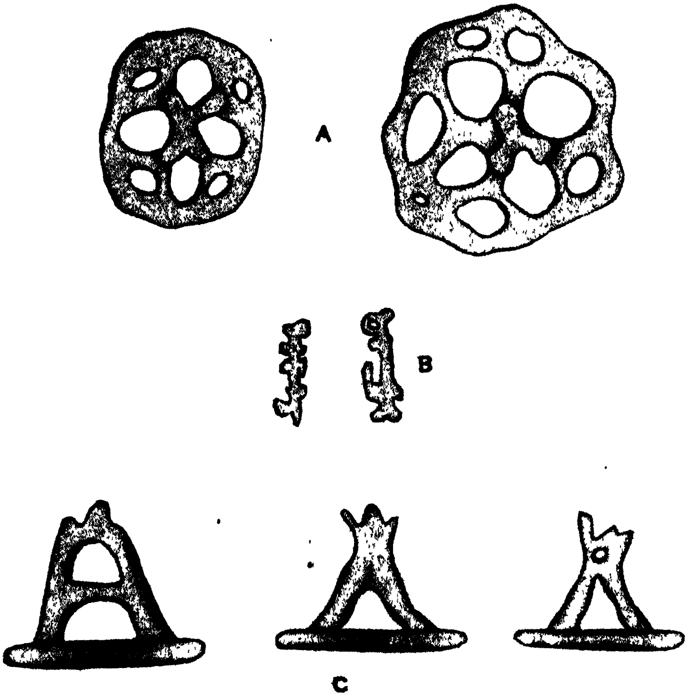
The deposits agree with Augustin's description and consist of tables and buttons. The tables (text-fig. 17 A & C) generally have four large central holes and four smaller peripheral holes. In a few cases the peripheral holes are more numerous. The spines are short and are generally imperfectly formed. In the most perfect specimens the spire has a rectangular top which bears blunt spines. In the majority of instances, however, the tops of the spires are very imperfect and irregular. The buttons are very irregular in shape, and the more perfect specimens suggest a derivation from perforated plates (text-fig. 17 B).

Diameter of tables up to 37 μ.

Length of buttons 22 μ.

General distribution. East Africa, Japan.

Text-fig. 17.



Holothuria dofleinii. Spicules.

A. Tables, from above. × 860.
B. "Buttons." × 640.
C. Tables (side view). × 670.

HOLOTHURIA IMPATIENS Forskål.

Fistularia impatiens Forskål, 1775 (**1**).
Trepang impatiens Jaeger, 1833 (**3**).
Holothuria fulva Quoy & Gaimard, 1833 (**4**).
Thyone impatiens Blainville, 1834 (**5**).
Sporadipus impatiens Grube, 1840 (**7**).
Holothuria botellus Selenka, 1867 (**10**).
Holothuria impatiens Lampert, 1885 (**18**); Théel, 1886 (**20**); Bell, 1886 (**19**), 1887 (**22**): Ludwig, 1887 (**23**); Sluiter, 1887 (**24**), 1901 (**28**); Koehler & Vaney, 1908 (**31**).

One specimen from Station IX. Matemo Is.

Length 75 mm.; breadth 15 mm.

One specimen from Station II. Maiyapa Bay.

Length 90 mm.; breadth 20 mm.

The colour and general characters agree with Théel's description. There are eighteen pinkish coloured tentacles situated in two rows. The deposits consist of tables and buttons.

Diameter of tables 92·5 μ.

Length of buttons 80 μ to 95 μ.

General distribution. Mediterranean, Indian Ocean, East Indies, Pacific Islands.

HOLOTHURIA LINEATA Ludwig.

Holothuria lineata Ludwig, 1875 (**12**).

Labidodemas punctulatum Haacke, 1880 (**14**).

Holothuria lineata Bell, 1884 (**17**); Lampert, 1885 (**18**); Théel, 1886 (**20**).

One specimen from Station II. Maiyapa Bay.

Length 23 mm.; breadth 9 mm.

This extremely small specimen possesses the characters of the above species.

There are twenty tentacles present.

The deposits are similar to those of *Holothuria lineata* and *Holothuria pardalis*, and consist of tables and buttons. The buttons are asymmetrical and are scattered.

Diameter of tables 75 μ.

Length of buttons 55 μ.

General distribution. Bowen, Red Sea, Mauritius, Thursday Is.

HOLOTHURIA MARMORATA Jaeger.

Bohadschia marmorata Jaeger, 1833 (**3**).

Sporadipus ualensis (subgenus *Colpochirota*) Brandt, 1835 (**6**).

Holothuria ualensis Selenka, 1867 (**10**).

Holothuria brandtii Selenka, 1867 (**10**).

Holothuria marmorata Semper, 1868 (**11**).

Holothuria utrimquestigmosa Haacke, 1880 (**14**).

Holothuria marmorata Lampert, 1885 (**18**); Théel, 1886 (**20**); Bell, 1887 (**21**); Sluiter, 1887 (**24**), 1901 (**28**); Pearson, 1903 (**29**).

One specimen from Station I. Tunghi Bay.

Length 90 mm.; breadth 20 mm.

This specimen is eviscerated, but it agrees with Théel's description.

The deposits consist of irregularly branched rods, the largest being about 48 μ long.

General distribution. Indo-Pacific region.

HOLOTHURIA MARTENSII Semper.

Holothuria martensii Semper, 1868 (**11**); Théel, 1886 (**20**).

Two specimens from Station VII. South of Pekawi.

Length 43 mm. and 30 mm.

Breadth 13 mm. and 10 mm.

These specimens agree with Théel's description.

Deposits. The tables vary in appearance and have a diameter ranging from 70 μ to 110 μ. The tables have an extremely high spire—up to 110 μ in height—and have seven or eight cross-beams. The buttons present great variations in size and appearance. The largest are about 110 μ in length. These are generally smooth and have eight or nine pairs of holes. The smaller buttons are about 70 μ in length and are often knobbed and have about six pairs of holes.

General distribution. Amboina, Celebes, Banda, and East Africa.

HOLOTHURIA MONACARIA Lesson.

Psolus monacaria Lesson, 1830 (**2**).
Holothuria flammea Quoy & Gaimard, 1833 (**4**).
Holothuria fusco-punctata Quoy & Gaimard, 1833 (**4**).
Holothuria fasciola Quoy & Gaimard, 1833 (**4**).
Stichopus flammeus Brandt, 1835 (**6**).
Stichopus gyrifer Selenka, 1867 (**10**).
Labidodemas leucopus Haacke, 1880 (**14**).
Holothuria monacaria Lampert, 1885 (**18**); Théel, 1886 (**20**); Ludwig, 1887 (**23**); Sluiter, 1887 (**24**), 1901 (**28**); Pearson, 1903 (**29**).

One specimen from Station VII. Pekawi Bay.

Length 60 mm.; breadth 17 mm.

The spicules consist of tables and buttons.

The tables have twelve peripheral holes, those opposite the rods of the spire being slightly larger than the others. These four persist when the others are broken. Many of the tables, therefore, have only four peripheral holes.

Diameter of tables up to 55·5 μ.

Length of buttons 55·5 μ.

General distribution. Indian Ocean, East Indies, Australia, Pacific Islands.

HOLOTHURIA SCABRA Jaeger.

Holothuria scabra Jaeger, 1833 (**3**).
Holothuria tigris Selenka, 1867 (**10**).
Holothuria scabra Semper, 1868 (**11**); Lampert, 1885 (**18**); Théel, 1886 (**20**); Ludwig, 1887 (**23**); Sluiter, 1887 (**24**), 1901 (**28**).
Holothuria cadelli Bell, 1887 (**21**).
Holothuria gallensis Pearson, 1903 (**29**).
Holothuria scabra Koehler & Vaney, 1908 (**31**).

Two specimens from Station I. Tunghi Bay.

Length 150 mm. and 105 mm.

Breadth 40 mm. and 35 mm.

This is undoubtedly the same species as *Holothuria gallensis* Pearson (**29**), so that this latter name must be included as one of the synonyms of *Holothuria scabra.*

The two specimens in this collection agree with my description of *H. gallensis* (**29**) except with regard to the colour. In neither specimen is the dorsal surface marked by the transverse black and yellow bands that were present in the Ceylon specimens. The dorsal surface is uniformly grey in colour and evidently resembles the Fiji specimen described by Théel (**20**).

The ventral surface is yellowish-white and the dark grey patches are not nearly so numerous as in the Ceylon specimens.

The deposits are similar to those described in the Ceylon specimens.

Length of buttons 37 μ.

Diameter of tables 63 μ.

General distribution. Indian Ocean, Philippines, Fiji.

HOLOTHURIA VAGABUNDA Selenka.

? *Stichopus* (subgen. *Gymnochirota*) *leucospilota* Brandt, 1835 (**6**).

Holothuria vagabunda Selenka, 1867 (**10**); Semper, 1868 (**11**); Lampert, 1885 (**18**); Théel, 1886 (**20**); Bell, 1886 (**19**); Sluiter, 1887 (**24**), 1901 (**28**); Pearson, 1903 (**29**); Koehler & Vaney, 1908 (**31**).

One specimen from Station IX. Matemo Is.

Length 80 mm.; breadth 17 mm.

There is nothing new to add to previous descriptions of this species.

Length of buttons 44 μ.

Diameter of tables 44 μ.

General distribution. Indian Ocean, Hong Kong, Pacific Islands.

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3. Marine Fauna: Mergui Archipelago, Lower Burma. Collected by Jas. J. Simpson, M.A., B.Sc., and R. N. Rudmose-Brown, B.Sc., University of Aberdeen, February 1907—May 1907: HOLOTHURIOIDEA. By JOSEPH PEARSON, D.Sc., F.L.S., Demonstrator and Assistant Lecturer in Zoology, University of Liverpool *.

[Received November 23, 1909.]

(Text-figures 18–21.)

Owing to the kindness of Mr. Simpson, I have had an opportunity of examining the collection of Holothurians obtained by him and Mr. Rudmose-Brown from the Mergui Archipelago. This collection, which comprises fourteen species, is typical of the Indian Ocean. There are no new species to record, and I have noted no points of special interest with the exception of the occurrence of *Thyone fusus* var. *papuensis*. This form, which differs only from *Thyone fusus* in the large size of the calcareous ring, is interesting because of its distribution. The latter species is distinctly northern in its distribution and occurs in the cold waters of N.W. Europe. The variety *papuensis* has been obtained only from tropical seas, once by the 'Challenger' in the Torres Straits, twice by Prof. Herdman off Ceylon, and it is also represented in the present collection.

The following is a list of species in the collection:

Cucumaria imbricata Semper.
Cucumaria semperi Bell.
Colochirus inornatus von Marenzeller.
Colochirus cucumis Semper.
Thyone fusus, var. *papuensis* Théel.
Thyone sacellus Selenka.
Actinocucumis typica Ludwig.
Phyllophorus cebuensis Semper.
Mülleria echinites Jaeger.
Holothuria curiosa Ludwig.
Holothuria impatiens Forskål.
Holothuria ocellata Jaeger.
Holothuria princeps Selenka.
Holothuria scabra Jaeger.

List of Stations at which Holothurians were obtained.

STATION I. East of Tavoy Is. and Port Owen.
Bottom. Sand, broken shell, and mud.
Depth. 4–12 fathoms.
Holothuria curiosa.

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* Communicated by Prof. W. N. PARKER, Ph.D., F.Z.S.

STATION VII. Haycock Is. to Hummock Is.
Bottom. Rock and mud, or sand and shell.
Depth. 5–15 fathoms.
Cucumaria imbricata.
Holothuria princeps.

STATION VIII. Port Maria (Elphinstone Is.) and Castle Is.
Bottom. Sand.
Depth. 1–5 fathoms.
Holothuria impatiens.

STATION IX. Between Bentinck Is. and Courts Is
Bottom. Sand and shell.
Depth. 12–26 fathoms.
Colochirus cucumis.

STATION XIV. Bushby Is. pearling ground.
Bottom. Sand and mud.
Depth. Shore to 21 fathoms.
Cucumaria semperi.

STATION XVII. West of Sir John Malcolm Is.
Bottom. Coarse sand and broken shell.
Depth. 13–18½ fathoms.
Colochirus cucumis.

STATION XVIII. W. & S.W. of Page Is.
Bottom. Sand, shell, and rock.
Depth. 10–21 fathoms.
Thyone sacellus.

STATION XXII. Hastings Harbour.
Bottom. Rock and sand.
Depth. 3–20 fathoms and shore.
Colochirus cucumis.

STATION XXIV. Cat Is.
Bottom. Rock, sand, and broken shell.
Depth. 8–22 fathoms.
Colochirus cucumis.

STATION XXV. Gregory Group.
Bottom. Stones and broken shell.
Depth. 4–14 fathoms.
Thyone sacellus.
Actinocucumis typica.
Phyllophorus cebuensis.

STATION XXVIII. Riou Is., Hobson Is. and adjacent islands.
Bottom. Rock and sand.
Depth. 2–8 fathoms.
Mülleria echinites.
Holothuria scabra.

STATION XXXII. S.W. of Domel Is.
Bottom. Sand and mud.
Depth. 26–29 fathoms.
Thyone fusus var. *papuensis.*

STATION XXXIII. Christmas Is. Group.
Bottom. Rock, sand, and mud.
Depth. 8–23 fathoms.
Colochirus cucumis.

Moscos Islands.
Cucumaria semperi.
Thyone sacellus.

CUCUMARIA IMBRICATA Semper.

Ocnus imbricatus Semper, 1868 (**7**).*
Ocnus javanicus Sluiter, 1880 (**9**); Lampert, 1885 (**13**).
Ocnus imbricatus Lampert, 1885 (**13**).
Ocnus typicus Théel, 1886 (**15**).
Ocnus javanicus Théel, 1886 (**15**).
Ocnus typicus Ludwig, 1887 (**17**).
Cucumaria imbricata Ludwig, 1891 (**19**); Sluiter, 1901 (**20**); Pearson, 1903 (**21**); Koehler & Vaney, 1908 (**22**).

One specimen from Station VII. Haycock Is.

This specimen agrees in every respect with the descriptions of Semper and Théel. The body has a total length of 40 mm. and is bent so that the trivium is on the convex side. There are 19 pedicels on each of the five ambulacra. The deposits are typical and agree with the sizes given by Théel.

General distribution. Bohol, Java, Hongkong, Ceylon, Bay of Bengal.

CUCUMARIA SEMPERI Bell.

Cucumaria semperi Bell, 1884 (**12**); Lampert, 1885 (**13**); Théel, 1886 (**15**).

Two specimens :—

One from Station XIV. Bushby Is. Length 20 mm.; breadth 6 mm.

One from Moscos Islands. Length 15 mm.; breadth 6 mm.

In the larger specimen the pedicels are arranged in five double rows. The smaller specimen is much crushed and the arrangement of the pedicels is hard to determine. The colour of the two specimens, which is yellowish-white in spirit, does not agree with the colour of the 'Alert' specimens described by Bell.

The calcareous ring (text-fig. 18 B) is one-sixth as long as the body. Both the radials and inter-radials have short triangular anterior prolongations. The radials also have long posterior bifurcations. Both the radials and inter-radials are composed of a large number of pieces.

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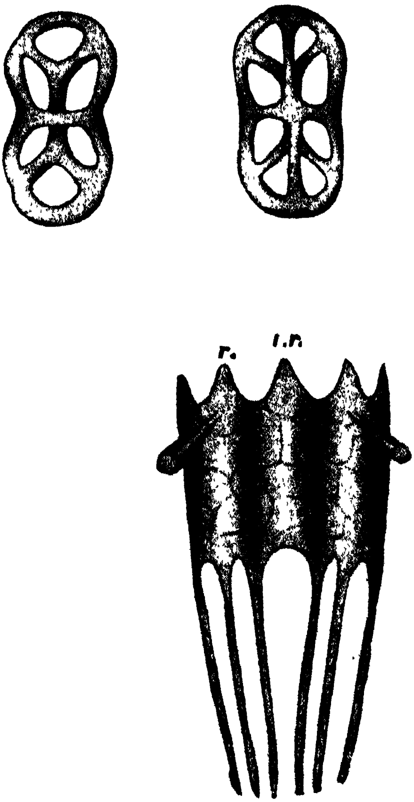
* The numbers in brackets refer to the Bibliography, pp. 193 & 194.

The retractor muscles connected with the calcareous ring are well developed and are attached to the body-wall half-way down the body.

Text-fig. 18.



Cucumaria semperi.

A. Spicules. × 700.

B. Calcareous ring. × 16.

r. = radial. *i.r.* = inter-radial.

The deposits agree with Bell's description and figures. The plates in the general integument are subject to considerable variation (see text-fig. 18 A).

The size of a normal plate is about 40 μ long and 26 μ broad.

General distribution. Port Denison, Torres Straits.

COLOCHIRUS INORNATUS von Marenzeller.

Colochirus inornatus von Marenzeller, 1881 (**10**); Lampert, 1885 (**13**); Théel, 1886 (**15**).

Six specimens. Locality not given.

	mm.	mm.	mm.	mm.	mm.	mm.
Length	65	45	45	52	53	39
Breadth	14	11	13	14	14	12

These specimens agree with Théel's description. They have the form which is typical of the genus *Colochirus*, i. e. a quadrangular body which becomes pentagonal at either end. The pedicels are confined to the ventral surface and are arranged in three rows. This species differs from many other members of this genus in not having the large tubercles. The colour in spirit is yellowish-white on the trivium and brown on the rest of the body. The pedicels are yellowish-white. There are ten tentacles, the two ventral ones being smaller than the rest. The tentacles are yellow.

The deposits are typical.

Length of perforated plates 67 μ; width 48 μ.

Length of large scales 300 μ.

Length of buttons 74 μ.

General distribution. Japan, 'Challenger,' 11° 6′ N., 123° 9′ E.

COLOCHIRUS CUCUMIS Semper.

Colochirus cucumis Semper, 1868 (**7**); Lampert, 1885 (**13**); Théel, 1886 (**15**); Sluiter, 1887 (**18**); Sluiter, 1901 (**20**).

Eleven specimens from Station IX. Between Bentinck Is. and Courts Is.

	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Length	19	24	22	22	31	32	40	47	47	48	60
Breadth......	6	7	7	8	9	11	14	13	18	19	22

One specimen from Station XXIV. Cat Is.

Length 62 mm.; breadth 24 mm.

One specimen from Station XXXIII. "Christmas Is. Group."

Length 25 mm.; breadth 9 mm.

One specimen from Station XVII. West of Sir John Malcolm Is.

Length 70 mm.; breadth 16 mm.

One specimen from Station XXII. Hastings Harbour.

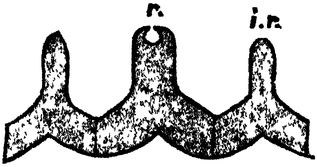
Length 17 mm.; breadth 6 mm.

Externally the specimens agree with Théel's description. The posterior end of the body is upturned so that the anus assumes a dorsal position. There are five anal teeth. Contrary to Théel's statement, there appear to be scales around the anus. The body is broad in front and gradually tapers towards the posterior end. There are the well-defined double rows of pedicels on the trivium. The calcareous ring (text-fig. 19) is composed of ten simple pieces which have no posterior prolongations. Anteriorly each radial is rod-shaped and the end is notched. The inter-radials also have anterior prolongations, but these are not notched.

The spicules agree with Théel's description. The spheres have a diameter of 44 μ, and the cups have a width of 37 μ.

General distribution. Bohol, Java, Japan.

Text-fig. 19.



Colochirus cucumis. Calcareous ring. × 5.

r. = radial. *i.r.* = inter-radial.

THYONE FUSUS, var. PAPUENSIS Théel.

Thyone fusus, var. *papuensis* Théel, 1886 (**15**); Pearson, 1903 (**21**).

One specimen from Station XXXII. S.W. of Domel Is.

Total length 25 mm.; greatest width 12 mm.

This specimen has a characteristic appearance, being broad in the middle and becoming suddenly much narrower at the anterior and posterior extremities. Externally it resembles in a marked degree the northern form *Thyone fusus*. Of the four recorded specimens of the above variety, I have had an opportunity of examining three, and I find that the only important difference between the variety and the parent species is in the nature of the calcareous ring. In both cases the shape is identical, but the ring is much larger in the variety than in *Thyone fusus*. In the specimen under examination the calcareous ring has a length of 12 mm., *i. e.* half the length of the body. In a specimen of *Thyone fusus* examined by Théel, the calcareous ring was only one-fifth the length of the body, and in a specimen I have examined the ring was even shorter.

The deposits agree with Théel's description, and appear to be very similar to the deposits of *Thyone fusus*. In the Ceylon specimens examined by me (**21**), there were tables scattered throughout the general integument as well as the deposits in the pedicels. In the Mergui specimen there are practically no deposits in the general integument, but in the pedicels there are tables similar to those described by Théel, and resembling those found in the pedicels of *Thyone fusus*.

Length of tables in pedicels 67 μ.

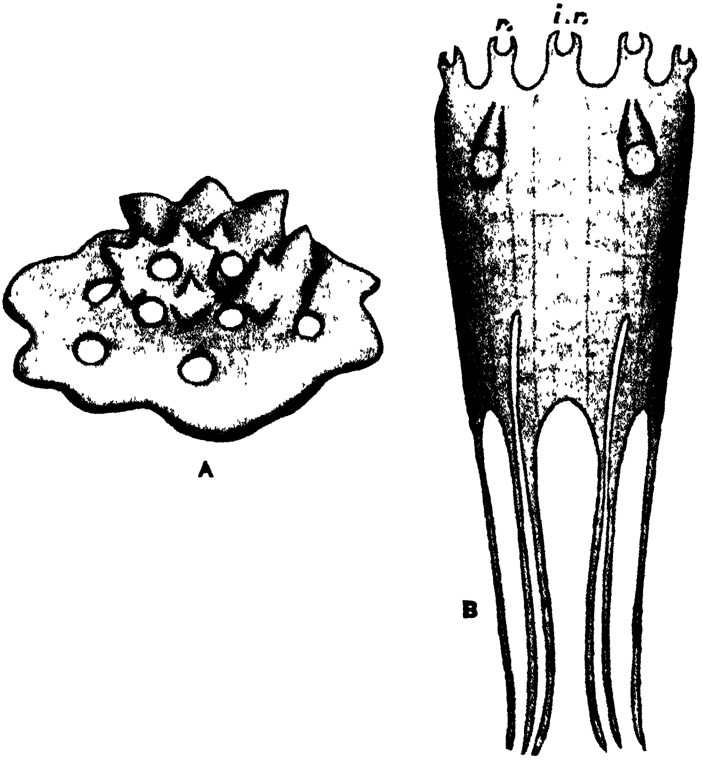
Diameter of tables in integument (Ceylon specimen) 59 μ.

General distribution. Torres Straits, Ceylon.

THYONE SACELLUS Selenka.

Stolus sacella Selenka, 1867 (**6**).
Thyone rigida Semper, 1868 (**7**).
Stereoderma murrayi Bell, 1883 (**11**).
Thyone sacellus Bell, 1884 (**12**).
Stereoderma murrayi Lampert, 1885 (**13**).
Thyone sacellus Lampert, 1885 (**13**); Bell, 1886 (**14**).
Thyone sacella Théel, 1886 (**15**).
Thyone sacellus Sluiter, 1887 (**18**); Ludwig, 1891 (**19**); Sluiter, 1901 (**20**); Pearson, 1903 (**21**).

Text-fig. 20.



Thyone sacellus.

A. Spicule. × 150.

B. Calcareous ring. × 8.
r. = radial. i.r. = inter-radial.

One specimen from Station XXV. Gregory Group.
Length 33 mm.; breadth 8 mm.

One specimen from Moscos Islands.

Length 60 mm.; breadth 9 mm.

Two specimens from Station XVIII. W. & S.W. of Page Is.

Length	105 mm.	106 mm.
Breadth	16 „	12 „

The general features of this species have been fully described by previous investigators. The hard integument due to the closely-packed spicules is characteristic of this species.

In the Ceylon Report I described plate-like spicules in addition to the deposits described by Théel and figured by Bell. A more detailed examination proves that these additional spicules have not the simple structure indicated by me in the Ceylon Report. In that report I described them as "plates having more than four holes and having short spines on the surface." That is the appearance presented from above, but in side view it is seen that from the centre of the large plate there arises an irregular massive superstructure which bears numerous spines (text-fig. 20 A).

Diameter of the large spinous tables ...	110 μ.
Length of the buttons	74 μ.

In the calcareous ring both the radials and inter-radials have short anterior processes which are notched in front. The radials have posterior bifurcations. Both the radials and inter-radials appear to be composed of numerous small pieces, the arrangement of which is not easily determined (text-fig. 20 B).

General distribution. Bohol, Japan, Torres Str., Aden, Zanzibar, Mozambique, Mergui, Java, Kurachee, Ceylon.

ACTINOCUCUMIS TYPICA Ludwig.

Actinocucumis typica Ludwig, 1875 (**8**).

? *Actinocucumis difficilis* Bell, 1884 (**12**).

Actinocucumis typica Lampert, 1885 (**13**); Théel, 1886 (**15**); Ludwig, 1891 (**19**).

One specimen from Station XXV. Gregory Group.

Length 55 mm.; breadth 9 mm.

There is nothing to add to previous descriptions of the external appearance.

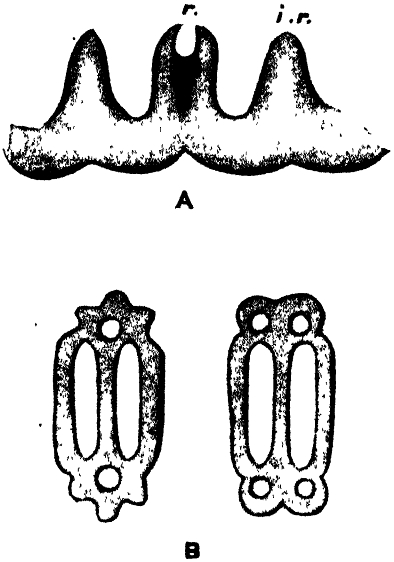
The calcareous ring has no posterior prolongations (text-fig. 21 A).

In addition to the small peculiar spicules, described by Théel as being "acorn-shaped," and which are very numerous, there are present delicate perforated plates which appear not to have been noticed hitherto. This is probably due to their being almost completely hidden by the other deposits (text-fig. 21 B).

Length of the "acorn-shaped" bodies ...	40 μ.
Length of perforated plates	40 μ.

General distribution. Bowen, Amoy, Albany Is., Torres Str., Kurachee.

Text-fig. 21.



Actinocucumis typica

A. Calcareous ring. × 7.
r. = radial. *i.r.* = inter-radial.
B. Plate-like spicules. × 750.

PHYLLOPHORUS CEBUENSIS Semper.

Thyonidium cebuense Semper, 1868 (**7**); Lampert, 1885 (**13**); Théel, 1886 (**15**).

Phyllophorus cebuensis Ludwig, 1891 (**19**); Pearson, 1903 (**21**).

One specimen from Station XXV. Gregory Group.

Length 15 mm.; breadth 6 mm.

An extremely small and much contracted specimen, which agrees in the main with the descriptions given by previous authors.

Diameter of tables ... 85 μ.
Height of tables ...... 85 μ.

General distribution. Philippines, Ceylon.

MULLERIA ECHINITES Jaeger.

Mülleria echinites Jaeger, 1833 (**2**); Semper, 1868 (**7**); Théel, 1886 (**15**); Ludwig, 1887 (**17**); Sluiter, 1901 (**20**).

One specimen from Station XXVIII. Riou Is.

Length 50 mm.; breadth 30 mm.

Agrees with Théel's description.

The pedicels on the trivium are arranged on three longitudinal ridges.

The deposits vary in size from 29 μ to 44 μ.

General distribution. Indian Ocean, Celebes, Sumatra, Fiji Is.

HOLOTHURIA CURIOSA Ludwig.

Holothuria curiosa Ludwig, 1875 (**8**); Lampert, 1885 (**13**); Théel, 1886 (**15**); Sluiter, 1901 (**20**).

One specimen from Station I. East of Tavoy Is.

Length 53 mm.; breadth 17 mm.

This specimen agrees with the descriptions of previous authors.

Diameter of tables ... 37 μ to 48 μ.
Length of buttons ... 41 μ.

General distribution. Bowen, Fiji, New Guinea, Philippines.

HOLOTHURIA IMPATIENS Forskål.

Fistularia impatiens Forskål, 1775 (**1**).
Trepang impatiens Jaeger, 1833 (**2**).
Holothuria fulva Quoy & Gaimard, 1833 (**3**).
Thyone impatiens Blainville, 1834 (**4**).
Sporadipus impatiens Grube, 1840 (**5**).
Holothuria botellus Selenka, 1867 (**6**.)
Holothuria impatiens Lampert, 1885 (**13**); Théel, 1886 (**15**); Bell, 1886 (**14**); Bell, 1887 (**16**); Ludwig, 1887 (**17**); Sluiter, 1887 (**18**); Sluiter, 1901 (**20**); Koehler & Vaney, 1908 (**22**).

One specimen from Station VIII. Port Maria.

Length 50 mm.; breadth 17 mm.

The specimen is much shrunken, but agrees with Théel's description in all respects.

Diameter of tables ... 92 μ.
Length of buttons ... 80 μ to 95 μ.

General distribution. Mediterranean, East Coast Africa, Indian Ocean, East Indies, Pacific Islands.

HOLOTHURIA OCELLATA Jaeger.

Holothuria ocellata Jaeger, 1833 (**2**); Semper, 1868 (**7**); Théel, 1886 (**15**); Koehler & Vaney, 1908 (**22**).

Locality not given.

Two dried specimens.

Length	220 mm.	135 mm.
Breadth	55 „	45 „

There is a well-defined ventral surface on which are found numerous pedicels not arranged in definite rows. The dorsal side of the body is well arched, and at each side of the body there are large protuberances. The mouth is ventral.

The deposits agree with Théel's description.

General distribution. Celebes, Torres Str.

HOLOTHURIA PRINCEPS Selenka.

Holothuria princeps Selenka, 1867 (**6**); Lampert, 1885 (**13**); Théel, 1886 (**15**).

One specimen from Station VII. Haycock Is.

Length 93 mm.; breadth 20 mm.

This specimen agrees very closely with Selenka's and Théel's descriptions. The tables have eight peripheral holes and a larger central one. The margin of the table is spinous. The spine is very short, and bears at the extremity eight large teeth as well as numerous smaller spines. The smooth buttons generally have six holes, but in some cases there are eight or ten.

Height of the tables ...... 52 μ.
Diameter of the tables ... 63 μ.
Length of buttons......... 55 μ.

General distribution. Florida, Egmont Key.

HOLOTHURIA SCABRA Jaeger.

Holothuria scabra Jaeger, 1833 (**2**).
Holothuria tigris Selenka, 1867 (**6**).
Holothuria scabra Semper, 1868 (**7**); Lampert, 1885 (**13**); Théel, 1886 (**15**); Sluiter, 1887 (**18**); Ludwig, 1887 (**17**).
Holothuria cadelli Bell, 1887 (**16**).
Holothuria scabra Sluiter, 1901 (**20**).
Holothuria gallensis Pearson, 1903 (**21**).
Holothuria scabra Koehler & Vaney, 1903 (**22**).

One specimen from Station XXVIII. Riou Is.

Length 175 mm.; breadth 60 mm.

This form is undoubtedly identical with *Holothuria gallensis* Pearson.

Diameter of tables ... 70 μ.
Height of tables ...... 44 μ.
Length of buttons ... 37 μ.

General distribution. Indian Ocean from East Coast of Africa to the East Indies, Philippines, Fiji.

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4. A Revision of the British Species of Ostracod Crustacea belonging to the Subfamilies *Candoninæ* and *Herpetocypridinæ*. By G. Stewardson Brady, M.D., LL.D., D.Sc., F.R.S., C.M.Z.S. (With Note on a Parasitic Worm, by Miss M. V. Lebour, M.Sc.)

[Received December 10, 1909.]

(Plates XIX.–XXX.*)

The species dealt with in this paper are separated from most other Cyprididæ by the absence, or the very scanty development, of setæ on the posterior antennæ, together with a full development of the caudal rami. When a setose antennal fascicle is present it never reaches further than the extremities of the terminal claws, and usually falls much short of them, so that in all cases the animal is destitute of swimming capacity. The species may

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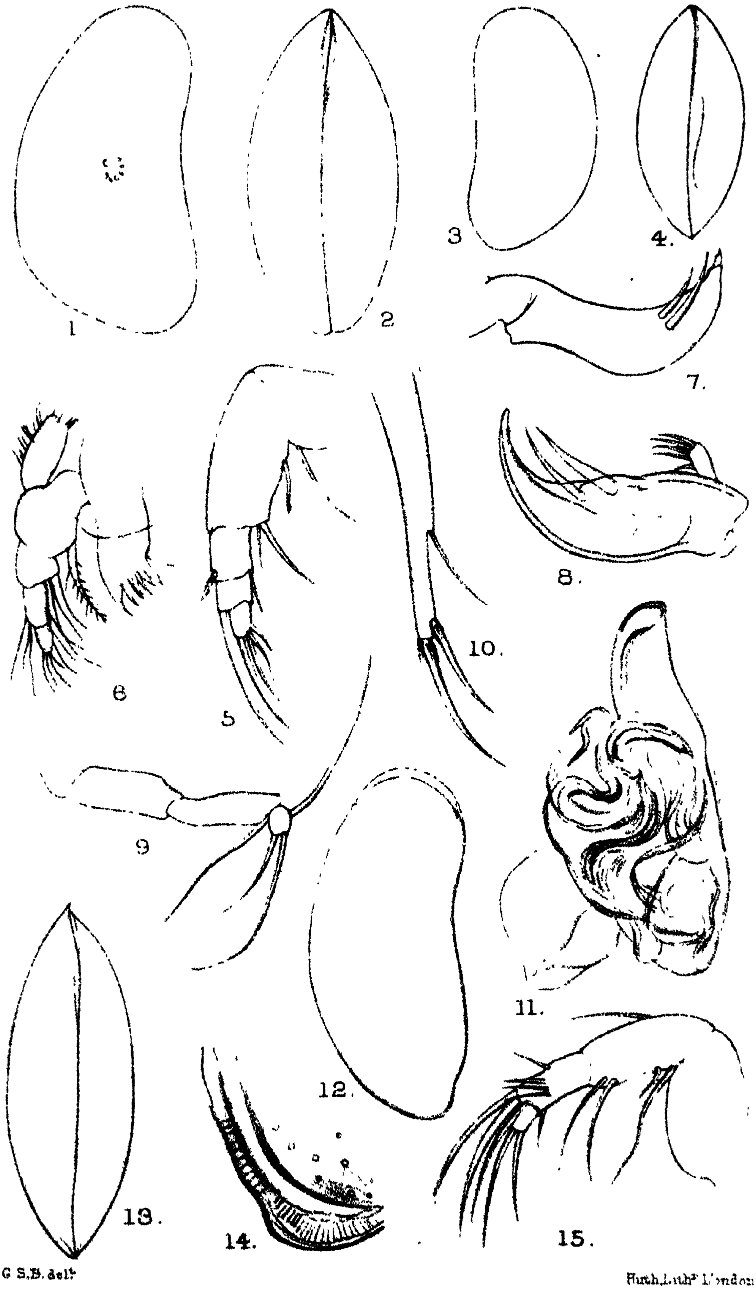
* For explanation of the Plates see pp. 217–220.



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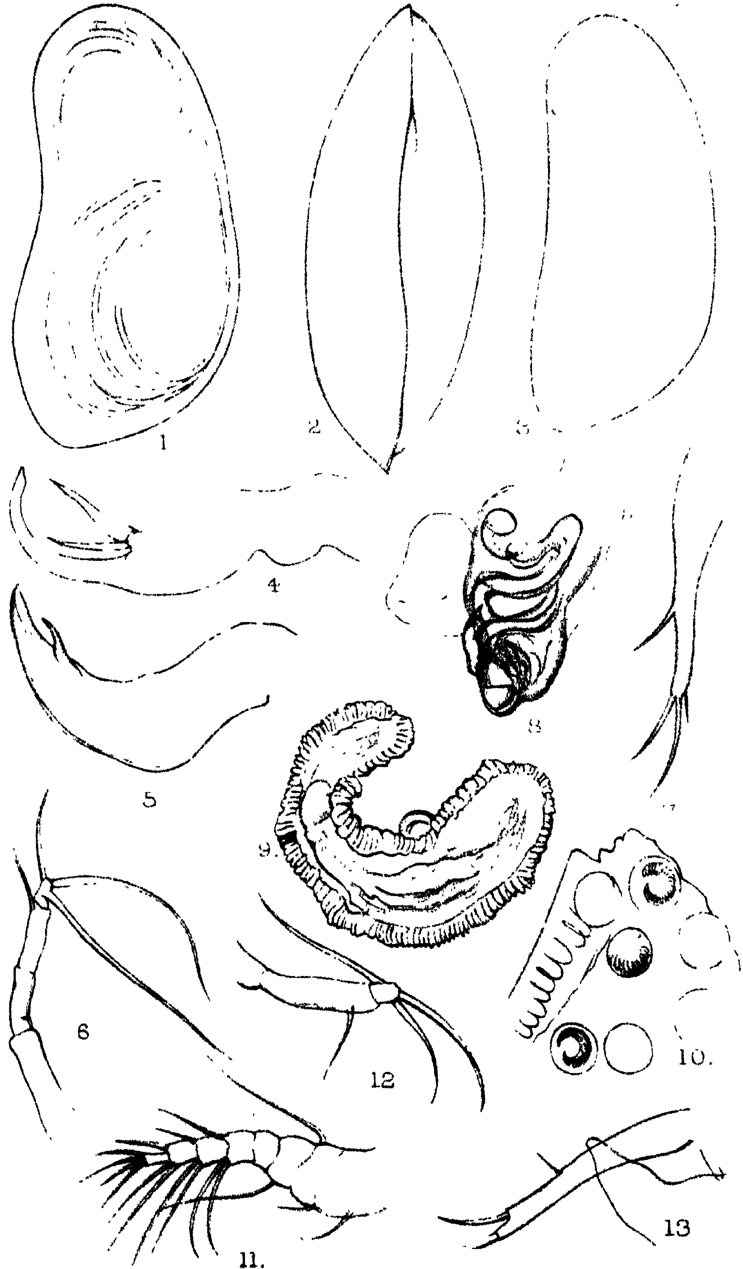
1–11. CANDONA CANDIDA.
12–15. CANDONA CAUDATA.



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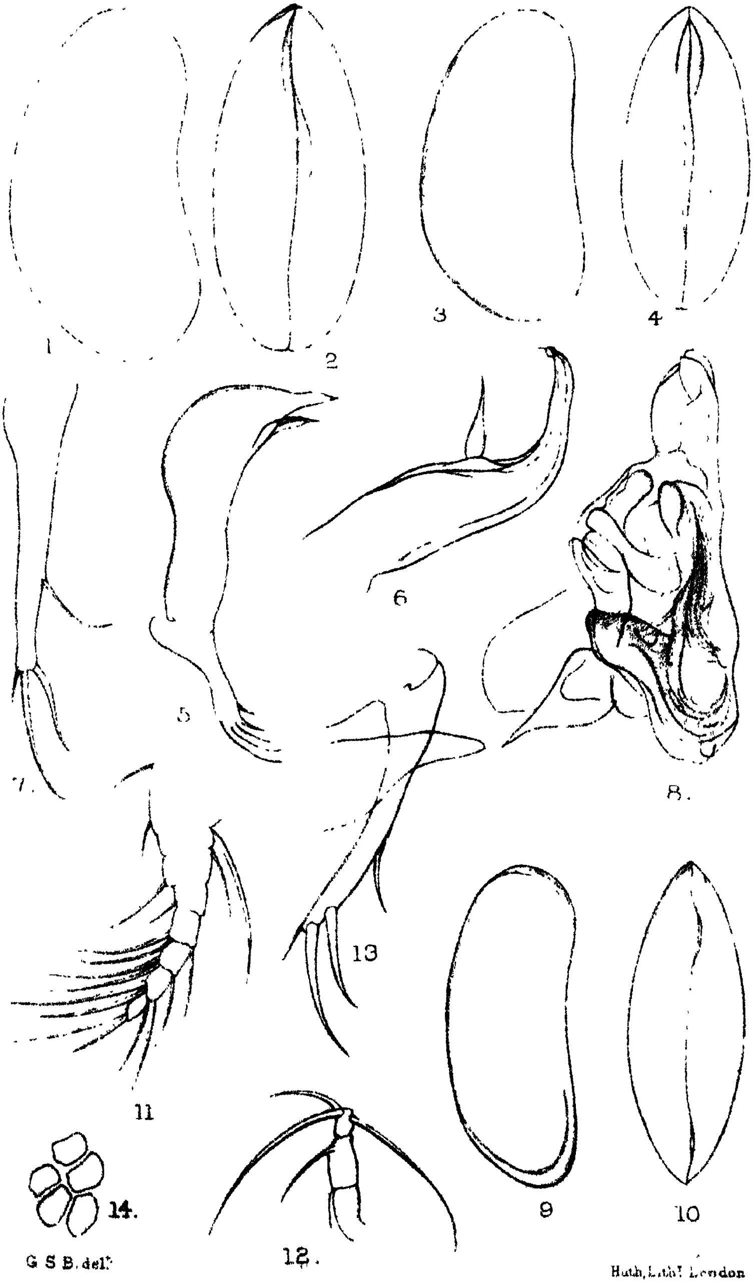
1-10. CANDONA ANGULATA.
11-13. CANDONA CAUDATA

P Z S 1910 Pl XXI.



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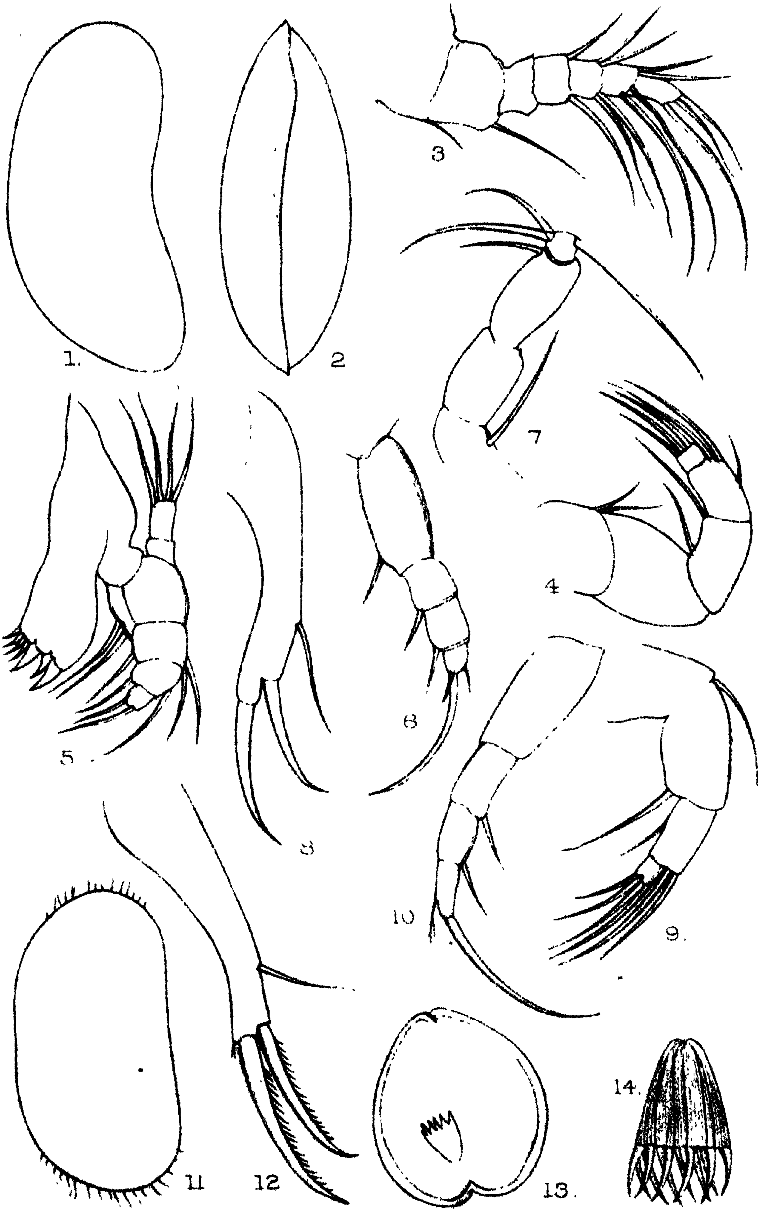
1–8. CANDONA NEGLECTA.

9–14. CANDONA SILIQUOSA.



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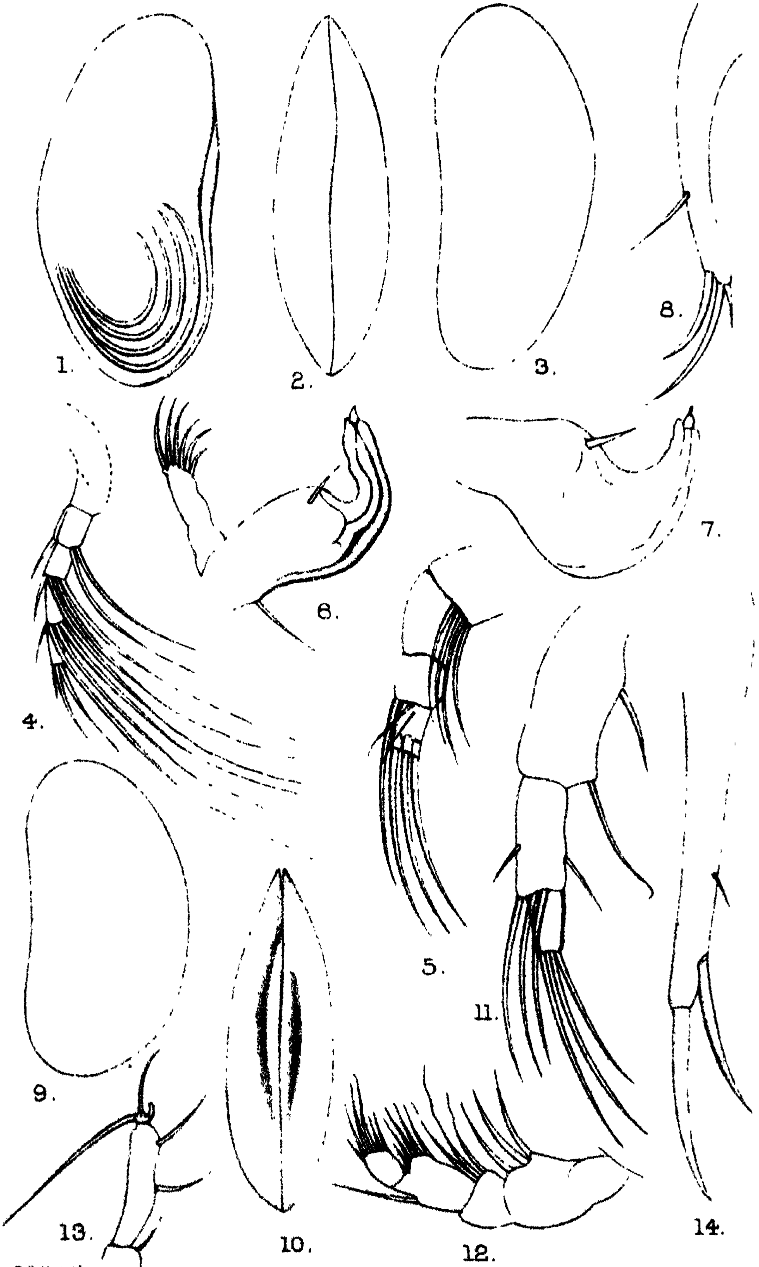
1 — 8. CANDONA ELONGATA

9 – 10. CANDONA SILIQUOSA.

11, 12. CANDONA STAGNALIS.

13, 14. SCOLEX OF TÆNIA.



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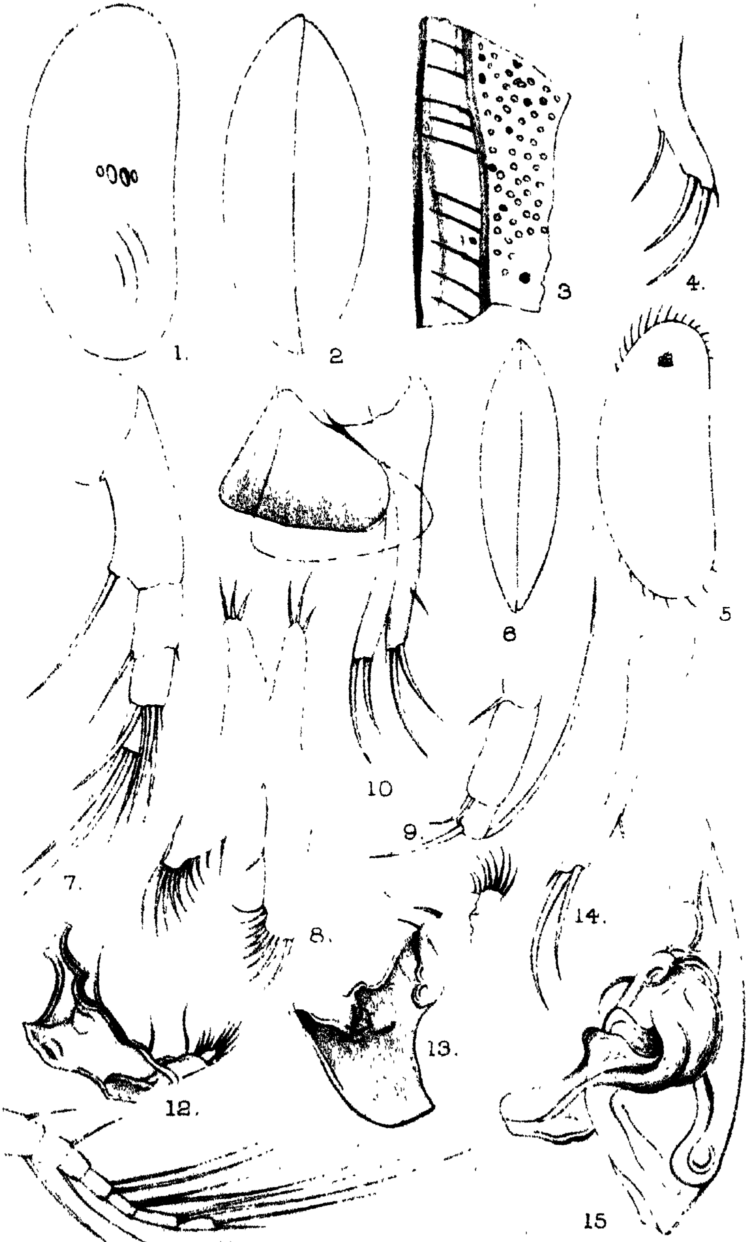
1–8. CANDONA PROTZI.
9–14. CANDONA CALEDONIÆ.



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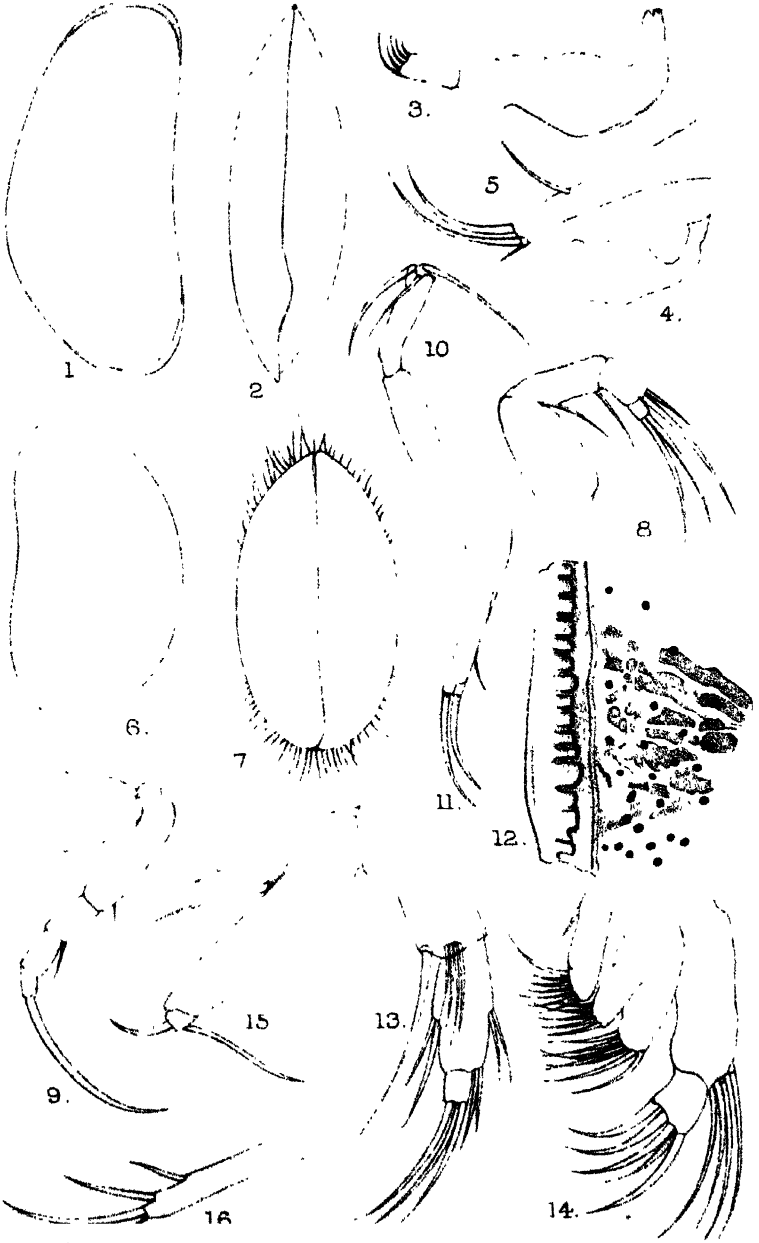
1–4. CANDONA LACTEA.
5–10. CANDONA FRAGILIS.
11–15. CANDONA FABÆFORMIS.

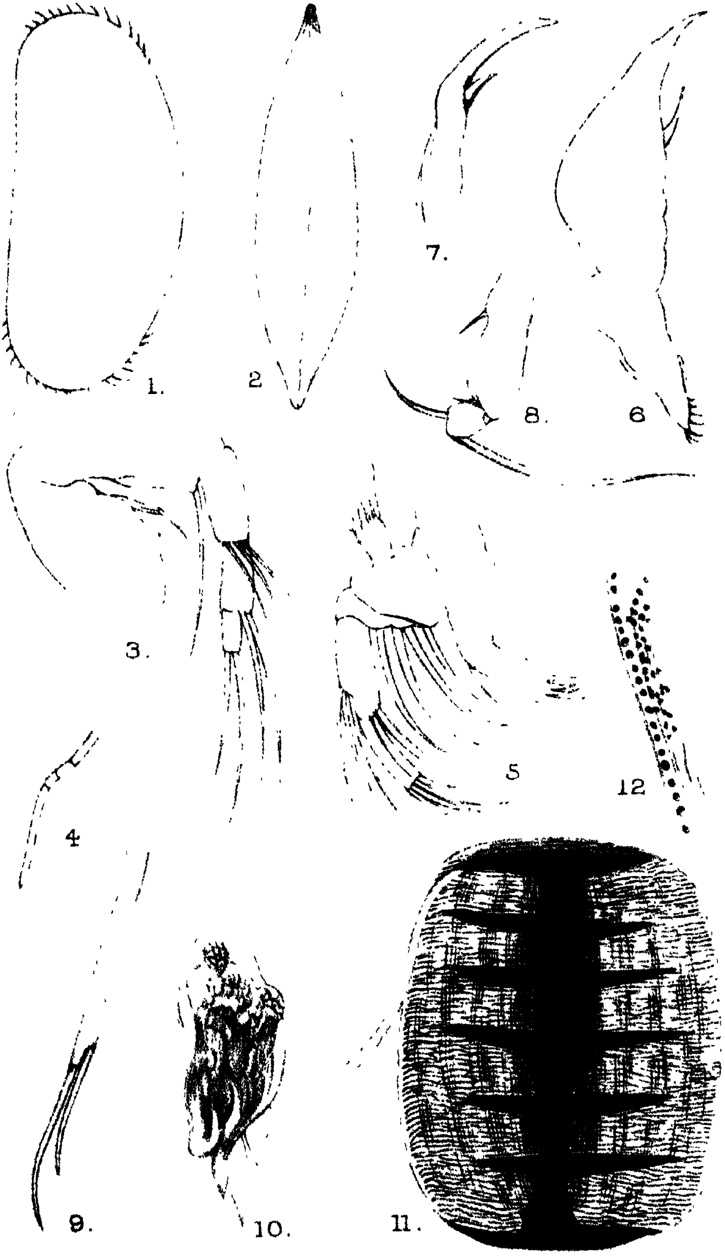
P.Z.S.1910.Pl.XXV.



G.S.B. del^{t}.

Huth, Lith^{r} London.

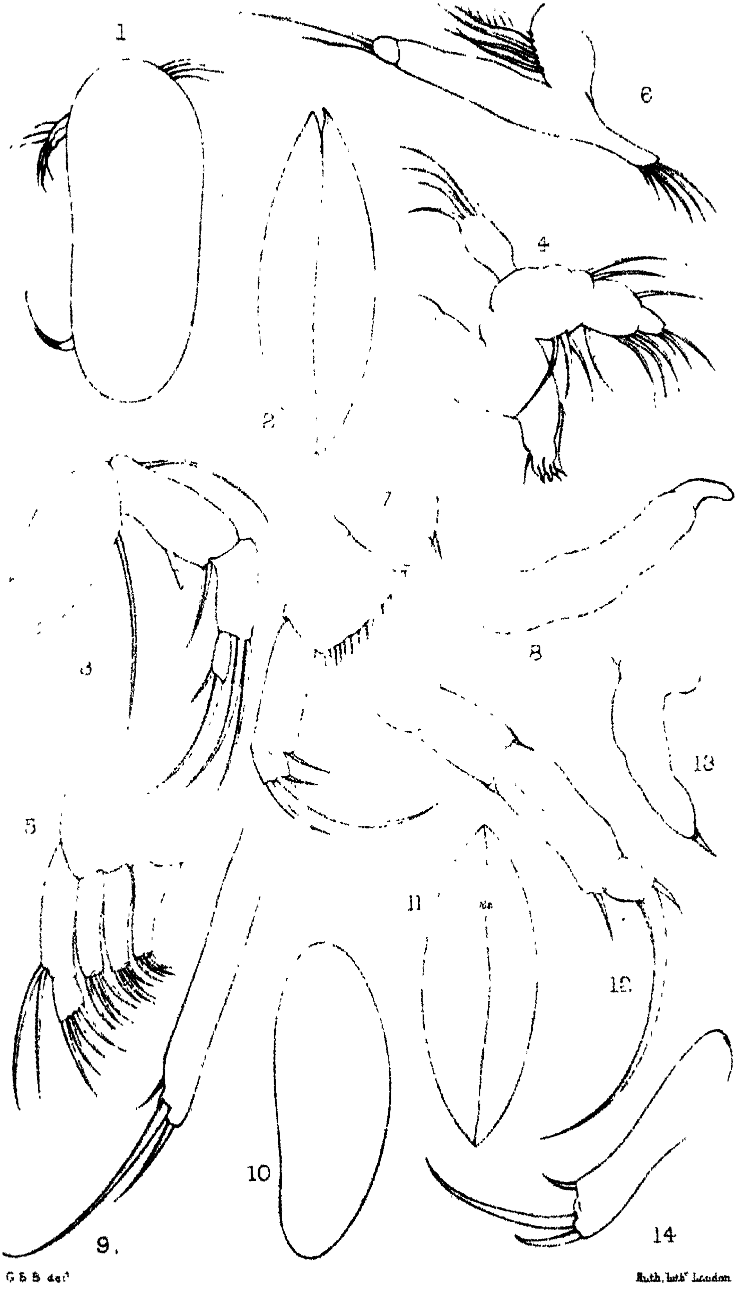
1 – 5. CANDONA HYALINA.
6 – 12. CANDONA BREVIS
13 – 16. PRIONOCYPRIS SERRATA.



G. S. B. del.t

Huth, Lith.r London

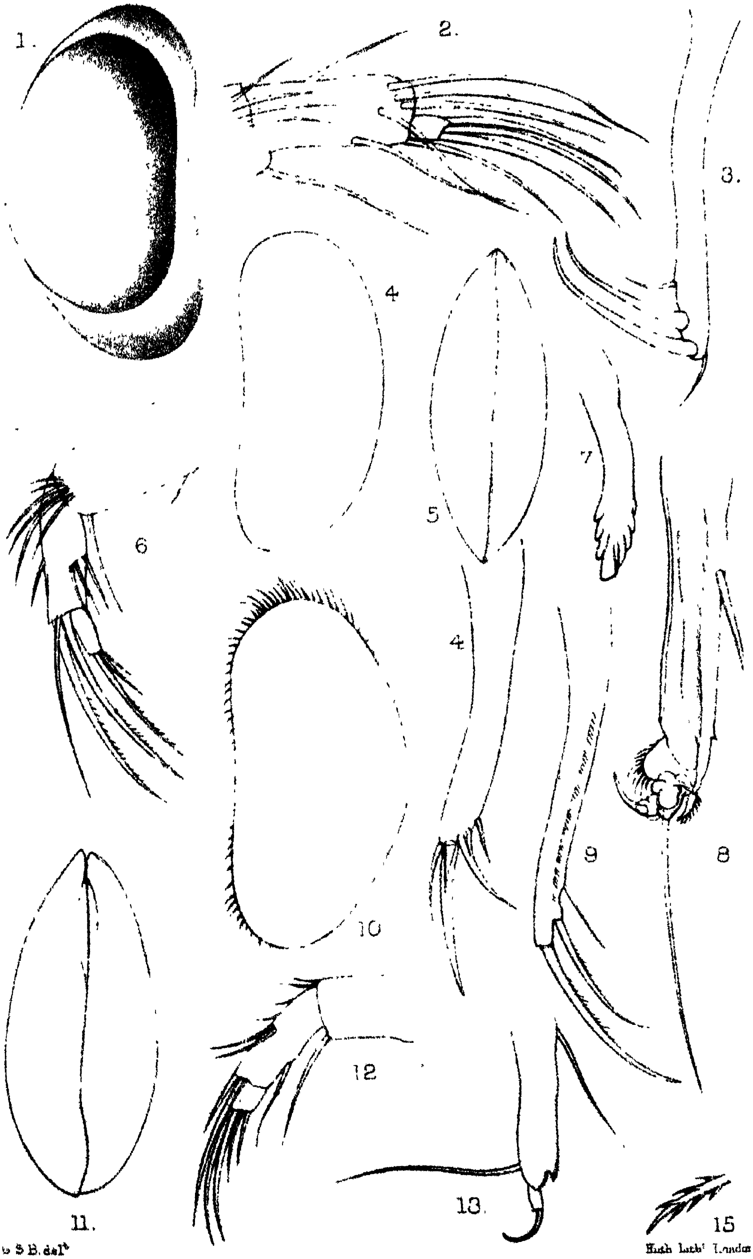
CANDONOPSIS SCOURFIELDI.



G. S. B. del.

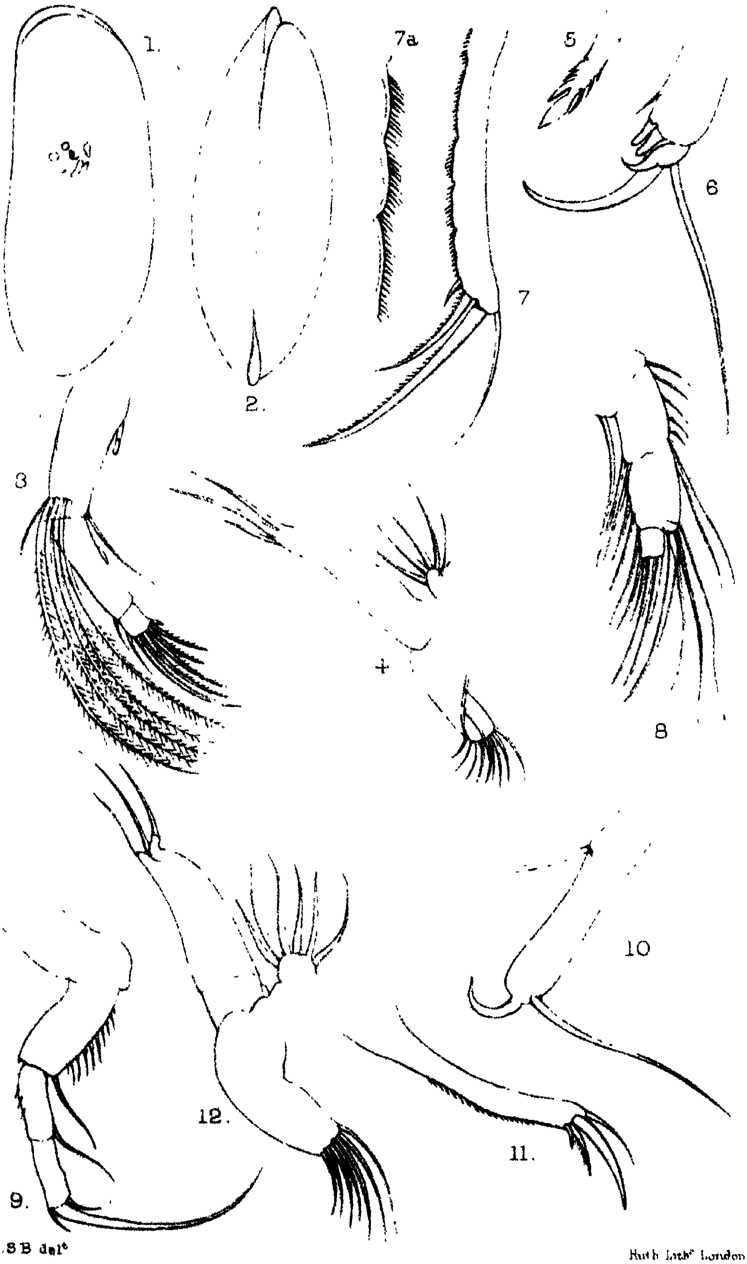
Ruth, lith.r London

1 – 9. SIPHLOCANDONA SIMILIS.
10 – 14. SIPHLOCANDONA NORMANI.



G. S. B. del.
Huth Lith. London

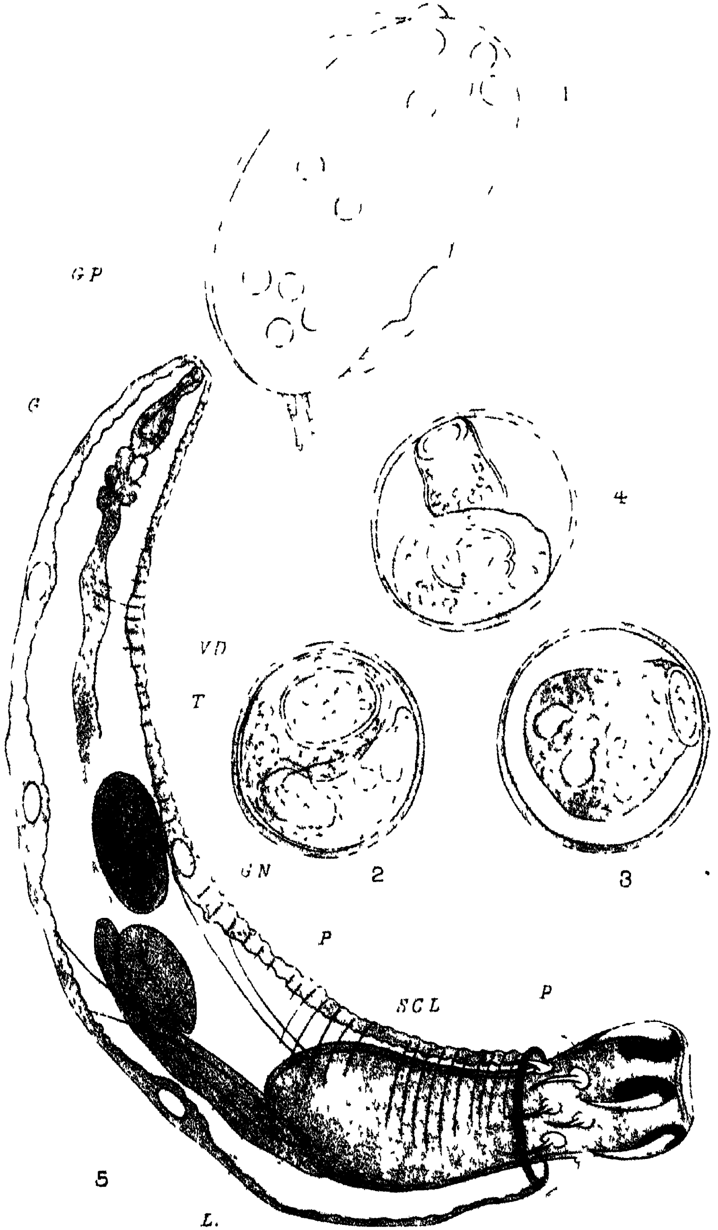
1–3. PRIONOCYPRIS TUMEFACTA.
4–9. HERPETOCYPRIS STRIGATA.
10–15. ILYODROMUS ROBERTSONI.



G.S.B del^t

Huth Lith^r London

1 – 7a. HERPETOCYPRIS CHEVREUXII.
8 – 11. ILYODROMUS OLIVACEUS.
12. ILYODROMUS ROBERTSONI.



M V Lebour del.

Huth Lith^r London

WORMS PARASITIC IN CANDONA ANGULATA

be grouped under two families or subfamilies, *Candoninæ* and *Herpetocypridinæ*, broadly separable from each other by the distinctly bisexual character of the former, with accompanying sexual reproduction, and the non-sexual (or hermaphrodite) character of the latter with a constant "parthenogenetic" reproduction. It is to be remembered, however, that in some cases which at one time were believed to constitute examples of "parthenogenetic" reproduction, males have been found to exist; and it is possible that the existence of that sex may hereafter be demonstrated in the case of other species. The number of species hitherto recognized as natives of the British Islands is only twenty-nine. This number will doubtless be considerably increased when various areas, at present but little known, have been thoroughly examined. The only parts of the country which can be said to have received anything like a complete investigation are:—(1) the southern counties of Scotland, which have been most diligently overhauled by Dr. Thomas Scott of the "Fishery Board for Scotland" and the late Dr. David Robertson of Cumbrae; (2) the counties of Northumberland and Durham and—less completely—Cumberland and Westmorland, where the Rev. Dr. Norman and myself have worked for many years; (3) the Fen District of East Anglia including the Norfolk Broads and the Cambridgeshire Fens, which have been fairly well investigated by Dr. Robertson and myself, and more recently by Mr. Robert Gurney and others. But even in these well-worked districts, much, no doubt, remains to reward future investigators.* The species here recorded are as follows:—

Candoninæ.

Candona candida *O. F. Müller.*
„ angulata *G. W. Muller.*
„ neglecta *G. O. Sars.*
„ caudata *Kaufmann.*
„ siliquosa *G. S. Brady.*
„ elongata *Brady & Norman.*
„ protzi *Hartwig.*
„ zenckeri *G. O. Sars.*
„ stagnalis *G. O. Sars.*
„ caledoniæ *G. S. Brady.*
„ lactea *Baird.*

Candona fragilis *Hartwig.*
„ fabæformis *Fischer.*
„ hyalina *Brady & Robertson.*
„ brevis *G. W. Muller.*
„ pubescens *Koch.*
„ rostrata *Brady & Norman.*
„ euplectella *Robertson.*
Candonopsis kingsleii *Br. & Robertson.*
„ scourfieldi *G. S. Brady.*
Siphlocandona similis *Baird.*
„ normani *G. S. Brady.*

Herpetocypridinæ.

Herpetocypris reptans *Baird.*
„ chevreuxii *G. O. Sars.*
„ strigata *O. F. Müller.*
Prionocypris serrata *Norman.*

Prionocypris tumefacta *Br. & Robertson.*
Ilyodromus robertsoni *Br. & Norm.*
„ olivaceus *Br. & Norm.*

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* The differences between so-called species are in many cases so small, and withal so inconstant, that the diagnosis becomes a matter of considerable difficulty. I have therefore attempted in this paper to place such species on a rather more stable footing—being at the same time quite aware that the attempt is only partially successful.

Fam. CYPRIDIDÆ.

Subfam. 1. *Candoninæ.*

Posterior antennæ destitute of swimming setæ.

Last foot with three unequal end setæ. Caudal rami well developed. Sexes distinct.

Subfam. 2. *Herpetocypridinæ.*

Setæ of the posterior antennæ not reaching beyond the extremities of the apical claws. First segment of maxilla with two smooth or toothed spines. Last pair of feet forcipate, with a curved claw. Caudal rami normal. Monœcious.

Subfam. CANDONINÆ.

Genus CANDONA Baird.

CANDONA CANDIDA O. F. Müller (in part). (Plate XIX. figs. 1-11.) (Syn. *Candona lucens* Baird.)

1785. *Cypris candida* Müller, Entomostraca, p. 62, tab. vi. figs. 7-9.

1866. *Candona candida* Brady, (1)* p. 383, pl. xxv. figs. 1-5.

1889. *Candona candida* Brady & Norman (in part), (2) Part i. p. 98, pl. x. figs. 14-17.

1891. ?*Candona candida* Vávra, (6) p. 48, fig. 14. 1-10.

1900. ?*Candona candida* G. W. Müller, (5) p. 15, pl. ii. figs. 1-3, 7-12.

1900. *Candona candida*, Kaufmann, (4) p. 379, pl. xxvii. figs. 10-13, pl. xxviii. figs. 18-25.

This is probably the commonest and most widely distributed form of the fresh-water *Candonæ*, but near the sea it seems generally to give place to *C. angulata* or *C. neglecta*, preferring the purer water of lakes, ponds, and streams.

The drawings here given (figs. 1-11) are from specimens taken in a pool above high-water mark at Penmaenmawr, which, however, would not be quite inaccessible to saline spray during storms. These agree closely with the descriptions and figures of Herr Kaufmann taken from Swiss specimens, and may I think fairly be taken to represent the typical form of *C. candida*. But the prehensile claws of the second pair of maxillæ as figured by G. W. Müller and Vávra differ so much from those of the form now under consideration, that I doubt whether they may not belong to some other species. The form referred to by Brady and Norman as var. *tumida* differs scarcely at all from that here taken as typical *C. candida*.

The shell of the male, as seen from the side, is more elongated than that of the female, and is more fully rounded posteriorly and somewhat less tumid when seen dorsally.

Shell smooth, and devoid of reticulated sculpture; colour white or brownish; seen by transmitted light of a smoky colour, and ornamented with a few small distant circular papillæ. Length 1–1·1 mm.

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* The numbers in brackets refer to the corresponding numbers in the list of papers given on p. 216.

The anterior antennæ are slender; the last three joints are twice or thrice as long as broad, and bear long setæ; posterior antennæ destitute of setose fascicle, each joint bearing only one or two short rigid hairs (fig. 5); "sense organ"* simply tapered, subsigmoid in shape (fig. 5); mandibular palp short and stout (fig. 6); palp of the second pair of maxillæ in the *female* not much elongated, bearing four apical setæ; in the *male* the prehensile portion of the limb both right and left is short and stout and has the usual spinous armature (figs. 7, 8); the feet of the last pair are not forcipate, but bear four apical setæ, three long and one short (fig. 9). Caudal rami nearly alike in both sexes, slender, bearing two slender non-pectinate terminal claws (fig. 10); marginal seta nearly as long as the claws, situated slightly beyond the middle of the limb.

CANDONA ANGULATA G. W. Müller. (Plate XX. figs. 1–8.)

1900. *Candona angulata* G. W. Müller, (5) p. 18, pl. i. figs. 1–17.

1866. *Candona candida* G. S. Brady, (1) pl. xxv. figs. 8, 9.

1889. *Candona candida* Brady & Norman (in part), (2) p. 99.

Shell of the *male* (fig. 1) seen laterally, elongated, subreniform, greatest height equal to more than half the length and situated much behind the middle; anterior extremity narrowed and rather obliquely rounded; posterior wider and obtusely angulated below the middle; dorsal margin sloping with a very slight curve from the highest point to the front, with a very steep and well pronounced curve backwards; ventral margin deeply sinuated in the middle: seen from above (fig. 2) the outline is oblong oval, with pointed extremities, more than twice as long as broad, widest in the middle. Shell-surface smooth, with a few distant, circular papillæ, often marked toward the posterior extremity with a beautifully reticulated ornament. Right valve smaller than the left which overlaps at both extremities. Length 1·6 mm.

Setæ of the anterior antennæ rather short, not exceeding in length the last six joints of the limb; prehensile portion of the second pair of maxillæ (figs. 4, 5) falcate, bearing near the extremity of the concave margin, on the left limb one spine, on the right two longer spines. Caudal rami slender (fig. 7), bearing two slender apical setæ and one short hair, and beyond the middle of the posterior margin a single long hair.

The shell of the *female* is somewhat smaller—length 1·4 mm.—longer in proportion to height, and having a less sinuated ventral with a less strongly arched dorsal margin (fig. 3).

This species was figured and briefly noticed in the 'Monograph of British Ostracoda' as a variety of *C. candida*, the only examples then known to me being a few dried shells found at Gravesend and sent to me by my friend Professor T. Rupert Jones. I have since taken it abundantly in the river Coquet near the Hermitage at Warkworth, and in Hickling Broad, Norfolk, in ditches near Arundel and Felixstowe, and in a pool above high water at Penmaenmawr; and I have specimens taken by the late Dr. D. Robertson in Lough Neagh. In all these places the water probably becomes slightly saline owing to the influence of sea-spray or perhaps occasional tidal overflow. The shell of this species is liable to be infested with circular papilliform excrescences which are probably the encysted stage of a trematode worm (Pl. XX. figs. 9, 10, Pl. XXX. figs. 1–4). A portion of the shell with the circular cysts is shown in fig. 10, and in the interior of two of the cysts may be seen the coiled young worm. And within the valves is occasionally to be found a fully developed worm, which has been examined for me at the Armstrong College, Newcastle-on-Tyne, by Miss M. V. Lebour, M.Sc., now of Leeds University. This is roughly represented in fig. 9. Miss Lebour pronounces it to be one of the group Acanthocephala belonging to the genus *Neorhynchus*, probably *N. claviceps* Zaddach (see Pl. XXX. fig. 5). Her remarks on the specimens—which she kindly allows me to reproduce here—are as follows:—

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* "Spur-organ" of Continental authors.

"It is about 1 mm. long with a thick skin and a retractile proboscis armed with few spines in number and arrangement the same as in *N. claviceps*. The most anterior spines are large, brownish, and much recurved, the two rows of smaller spines behind these are simpler and quite clear and colourless. In the thick subcuticular layer of the skin a few giant nuclei can be distinguished as in *N. claviceps*. All the specimens seen appear to be males. There is only one testis instead of two as in *N. claviceps*, which occurs near the centre of the body, and an indistinct vas deferens runs down from this, becomes more distinct where the glands appear, and opens at the extreme posterior end. The retractors of the proboscis are conspicuous, as are also the peculiar structures known as the lemnisci. Four specimens occurred in one *Candona* and single specimens in several others. Small Crustacea or water insects are the usual hosts for these Acanthocephala, and in the family *Neorhynchidæ* the larval forms are sexually mature. The adult *N. claviceps* lives in the carp, *Cyprinus carpio*, and the larval form in the larva of *Sialis lutaria*, one of the Neuroptera (Cambridge Natural History, vol. ii. p. 185). It is interesting to get this species in a new host, for it does not appear to have been noticed in *Candona* before."

CANDONA NEGLECTA G. O. Sars. (Plate XXI. figs. 1–8.)

1887. *Candona neglecta* G. O. Sars, Nye Bidrag til Kundskaben om Middelhavets Invertebratfauna, p. 107, pl. xv. figs. 5–7, pl. xix.

1866. *Candona candida* G. S. Brady (in part), (1) p. 383,

1889. *Candona candida* Brady & Norman (in part), (2) Part i. p. 98, pl. x. figs. 20–23, and var. *claviformis*, pl. x. figs. 1, 2.

1900. *Candona neglecta* G. W. Müller, (5) p. 17, pl. ii. figs. 4–6, 13–18.

1900. *Candona neglecta* Kaufmann, (4) p. 387, pl. xxix. figs. 1–5, pl. xxx. figs. 12–18, pl. xxxi. fig. 21.

The shell of the *male* seen laterally is reniform, lower in front than behind, greatest height situated much behind the middle and equal to rather more than half the length; extremities boldly rounded, the posterior much the wider of the two; dorsal margin boldly arched, sloping with a gentle curve toward the front, much more steeply behind, ventral deeply sinuated in the middle. Seen from above (fig. 2) the outline is ovate, slightly tapering to the front which is obtusely pointed, posterior extremity well rounded, greatest width in the middle and equal to half the length. Surface quite smooth. Length 1·55 mm.

The shell of the *female* differs in being smaller (figs. 3, 4), less deeply sinuated ventrally, and in having the two extremities more nearly equal in size. Length 1·35 mm.

The contained animal differs scarcely at all from that of *C. angulata*.

Among the British localities in which it has been found are Mutford (Suffolk), and other places in the Eastern fen district, the river Went at Ackworth (Yorkshire), in "the Mere," Scarborough, the Warn Burn (Northumberland), a pond near Sunderland now built over (G. S. B.), and a pond at Sedgefield, Co. Durham (Rev. Canon Norman). It is probably generally distributed, but has not usually been recognized as distinct from *C. candida*.

CANDONA CAUDATA Kaufmann. (Plate XIX. figs. 12–15; Plate XX. figs. 11–13.)

1900. *Candona caudata* Kaufmann, (4) p. 365, pl. xxiv. figs. 16–20, pl. xxvi. figs. 17–23.

The shell of the *female*, seen laterally (Pl. XIX. fig. 12), is elongated, subreniform, greatest height situated in the middle and equal to less than half the length: anterior extremity obliquely rounded, posterior narrower, scarcely rounded, almost angulated ventrally; dorsal margin evenly arched, sloping very gently in front, steeply behind; ventral sinuated in the middle and showing again a short sinus near the posterior extremity* (fig. 14): seen from above (fig. 13) the outline is narrowly oval, nearly thrice as long as broad, widest in the middle and thence tapering evenly to the extremities which are rather sharply pointed. Shell quite smooth, thin, semitransparent; colour yellowish with darker and lighter patches and a few scattered circular papillæ. Length 1·3 mm. Male unknown.

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* I cannot certainly say whether this sinus is found in one or both valves.

Anterior antennæ short (Pl. XX. fig. 11), the last four joints bearing short and rather rigid setæ; all the joints, except the first, nearly equal in length. Posterior antennæ four-jointed, stout, sparingly setiferous, the penultimate joint bearing a very rudimentary brush of about three short setæ (Pl. XIX. fig. 15). First pair of feet with small bristles at the extremities of each joint and at the apex a long curved claw; second pair with three long subequal setæ arising from the small terminal joint and a smaller one from the penultimate joint (Pl. XX. fig. 12). Abdomen terminating in two stout nipple-shaped projections of the genital lobe (fig. 13) which, however, are not so sharp nor so long as in *C. siliquosa*. Caudal rami bearing two not very long curved claws and near the middle of the posterior margin a single short hair.

I have met with three or four examples of this species in examining afresh a gathering made at Belsay, Northumberland, so long ago as 1866. The small lake from which the specimens came has, however, been drained and, I believe, built over. *Candona caudata* has not as yet been noticed in any other British locality; and Kaufmann is wrong in suggesting that the species referred to *C. acuminata* by Brady and Norman is identical with this species, which is, however, very nearly allied to *Candona elongata*. —so nearly that I was disposed at one time to unite the two forms under one specific name. The characters upon which I rely to distinguish them are as follows:—the shell in *C. caudata* (as seen by transmitted light) is without any definite structural character, but bears a few distant circular papillæ, in *C. elongata* it is coarse and vaguely areolated; seen externally the shell of *C. caudata* has always a produced postero-ventral angle, which is not seen in *C. elongata*. The anterior antennæ in *C. caudata* are not so stout nor are they so much dilated at the base as in the other species, and the joints of the last pair of feet are longer; lastly the caudal rami are more slender and the marginal seta is situated near the middle of the ramus. It is possible that the specimen figured by Brady and Norman as perhaps the young male of *C. elongata* may belong to *C. caudata*.

CANDONA SILIQUOSA, nom. n. (Plate XXI. figs. 9–14; Plate XXII. figs. 9, 10.)

1889. *Candona acuminata* Brady & Norman, (2) Part i. p. 104, pl. ix. figs. 9, 10, pl. x. figs. 5, 6.

(Not *C. acuminata* Fischer & G. W. Müller.)

The species referred by Brady and Norman to *C. acuminata* Fischer differs very considerably from the true *acuminata*, not only in the form of the shell but in certain points of internal anatomy. I am indebted to Dr. G. W. Müller for specimens of that species which put the matter beyond doubt. Our British specimens are very similar in general aspect as well as in internal structure to *C. caudata* Kaufmann, but they do not show the characteristic backward production of the shell, and the posterior processes of the abdomen are sharper and more elongated, while there are also some slight differences in the setæ of the limbs. Another nearly allied species is *C. protzi* Kaufmann, but here the differences are more conspicuous.

It therefore seems necessary to adopt a new name. It is probable that if male specimens were forthcoming, serviceable characters might be found, but none except females have hitherto been observed.

In addition to the localities mentioned in the Monograph (*loc. cit.*) I have found *C. siliquosa* in Barton Broad, Norfolk, and in ponds near Lyndhurst, Hants. Dr. T. Scott has taken it in many Scottish waters.

CANDONA ELONGATA Brady & Norman. (Plate XXII. figs. 1–8.)

1889. *Candona elongata* B. & N. (2) p. 100, pl. x. figs. 26–27.
1891. „ „ (?) Vávra, (6) p. 111.

Female. Length 1·3 mm. Shell, seen laterally, reniform, greatest height situated in the middle and equal to about half the length; extremities rounded, the anterior narrower than the posterior; dorsal margin evenly arched, ventral only slightly sinuated (fig. 1): seen dorsally the outline is rather narrowly ovate (fig. 2), pointed acutely in front, less acutely behind, width scarcely equal to half the length; left valve somewhat larger than the right and overlapping at the extremities. Surface of the shell smooth, colour brown.

The anterior antennæ are short and stout (fig. 3), the individual joints also short, all but the last two broader than long; the setæ also short and stout, the three longest not as long as the antennule itself, the rest very much shorter; mandible-palp very short and stout (fig. 5); palp of the second maxilla more than usually dilated; terminal joints of the second pair of feet short and stout (fig. 7). Caudal rami robust and curvate (fig. 8), the two apical claws nearly equal in length; the marginal seta moderately long and situated considerably beyond the middle of the limb.

In the original description of *C. elongata*, it seems probable that two quite distinct species have been taken as representing the two sexes, but it is impossible at present, owing to want of specimens, to clear the matter up. Lough Neagh, where the species was taken years ago by the Rev. Canon Norman, is up to the present the only known British locality for it, though specimens referred to it have been found in Bohemia by Herr Vávra. Dr. Vávra, however, writes to me that his supposed specimens of *C. elongata* were identified by the late Herr Hartwig as belonging to *C. protzi*.

The species is very closely similar to *C. siliquosa*; but the limbs generally are much more robust and the individual joints thicker and shorter; the caudal rami are stouter and more curvate, and the genital prolongation of the abdomen, which is so conspicuous in *C. siliquosa*, seems to be entirely absent. The shell is slightly larger than that of *C. siliquosa*.

CANDONA PROTZI Hartwig. (Plate XXIII. figs. 1–8.)

1898. *Candona protzi* Hartwig, Zool. Anzgr. p. 476.
1900. „ „ G. W. Müller, (5) p. 35, Taf. vi. figs. 4, 5, 17–22.
1891. *Candona elongata* Vávra (?), (6) p. 111.

Shell of the *male* (fig. 1) seen laterally oblong, subreniform, greatest height equal to half the length, situated in the middle; posterior extremity boldly rounded, anterior rounded but not so fully as the anterior; dorsal margin evenly arched, almost gibbous in the middle, ventral sinuated, with a slight pouting protuberance of both valves in front of the middle: seen dorsally (fig. 2) the outline is compressed, oblong-ovate, thrice as long as broad, acuminate in front, narrowed more abruptly toward the posterior extremity which is obtusely pointed. Shell-surface smooth; colour brown. Length 1 mm. Shell of the *female* (fig. 3) longer in proportion to the height and without protuberance of the ventral margin.

Anterior antennæ slender, with long, delicate setæ, the terminal joints more than twice as long as broad; setose fascicle of the posterior antennæ (fig. 5) scarcely reaching to the end of the last joint, terminal claws not pectinated; last joint of the last pair of legs not forcipate, bearing three setæ, two very long and one about half as long as the other two, penultimate joint with one short seta. Caudal rami slender, with smooth margins; terminal claws simple, not half as long as the limb, marginal seta situated a little beyond the middle (fig. 8). Prehensile claws of the posterior maxillæ in the *male* very robust, strongly falcate, the tips obtuse, emarginate, and armed with a minute hyaline mucronate apical process (figs. 6, 7).

Some of the specimens hitherto referred to *Candonopsis kingsleii* belong undoubtedly, as has been pointed out by Dr. G. W. Müller, to *C. protzi*. This is certainly the case with many Scottish examples, as for instance those from Lochmaben and Lewis. It is by no means easy to distinguish, except by careful dissection, between such closely similar forms as *C. protzi*, *C. kingsleii*, *C. hyalina*, and perhaps sometimes *C. fabæformis*. I am indebted to my friend Mr. D. J. Scourfield for specimens of *C. protzi* from Wanstead Park, Essex.

CANDONA ZENCKERI G. O. Sars.

1890. *Candona zenckeri* G. O. Sars, "Oversigt af Norges Crustaceer, ii. Branch., Ostrac., Cirrip.", Vidensk.-Selsk. Forhand. p. 66.
1896. *Candona zenckeri* Brady & Norman, (2) Part ii. p. 730, pl. lxiii. fig. 25, pl. lxviii. figs. 12, 13.

This species was found many years ago by the Rev. Canon Norman in a pond at Ferry Hill, Co. Durham, but has not been taken since in Britain.

I have nothing to add to the account given in the "Monograph" (*loc. cit.*).

CANDONA STAGNALIS G. O. Sars. (Plate XXII. figs. 11, 12.)

1890. *Candona stagnalis* G. O. Sars, "Oversigt af Norges Crustaceer, ii.," p. 69.

1891. *Candona ambigua* T. Scott, "Invertebrate Fauna of Inland Waters of Scotland" (Ninth Annual Report, Fishery Board for Scotland) p. 277, pl. iv. figs. 7 *a–c*.

1896. *Candona stagnalis* Brady & Norman, (2) Part ii. p. 729, pl. lxviii. figs. 14–17.

The only known British localities for this species are Lochgelly Loch and Loch Fitty, Fifeshire, where it was taken by Dr. T Scott. I have nothing to add to what has already been published respecting it.

CANDONA CALEDONIÆ, sp. n. (Plate XXIII. figs. 9–14.)

Female.—Shell seen laterally oblong, subovate, greatest height situated in the middle and equal to half the length; extremities well rounded, the anterior the wider and more obtuse of the two (fig. 9); dorsal margin forming an even and somewhat flattened arch, ventral very slightly sinuated in the middle: seen from above (fig 10) the outline is much compressed, tapering gently to the anterior extremity, rounded behind. the right valve slightly smaller than the left, width equal to one third of the length; hinge-margins depressed in the middle, forming a well-marked, shallow groove. Shell thin, structureless, showing no surface-markings whatever, mottled yellow, the colour partly dependent on the contained animal. Length 0·88 mm.

Posterior antennæ devoid of any setose fascicle; the last two joints bearing a few stout, claw-like setæ (fig. 11); no sensory setæ. The mandible-palp is stout, the terminal joints short, bearing a small branchial plate at the base (fig 12); last pair of feet (fig. 13) bearing a very small forcipate process on the minute apical joint, also two setæ of unequal length; the long penultimate joint has two marginal setæ. Caudal rami (fig. 14) straight, slender, bearing two stout, perfectly smooth terminal claws, the dorsal one considerably in front of the other; seta of the dorsal margin very short, distant from the apex about one third of the length of the limb.

Examples of this species have been in my collection for many years, but have hitherto been erroneously identified with *Candonopsis kingsleii.* A re-examination of the contained animal shows, however, that it has none of the distinctive generic characters of *Candonopsis*, nor can I assign it to any known species of *Candona*. Its nearest ally is probably *Candona stagnalis* G. O. Sars, from which, however, it differs in the non-flattened dorsal margin of the valves, in the absence of pitted shell-structure, in the elongated, quite straight caudal rami, the claws of which are distantly apart and devoid of marginal setæ.—My figures of the shell and caudal ramus of *C. stagnalis* are drawn from Norwegian specimens kindly sent to me by Professor Sars, but the figure of the caudal ramus does not agree very accurately with his description of it as being "almost straight."

For this species I can at present only specify with certainty a few localities in the West of Scotland:—lochs near Dumfries, Lochmaben, Loch Fadd, and lochs in Lewis.

CANDONA LACTEA Baird. (Plate XXIV. figs. 1–4.)

1850. *Candona lactea* Baird, Proc. Zool. Soc. Lond. p. 255, pl. xviii. (Annulosa) figs. 25–27.
1866. *Candona lactea* & *Candona detecta* Brady, (1) pp. 382, 384.
1889. *Candona lactea* Brady & Norman, (2) p. 100.

Female.—Length 0·75 mm. Shell seen from the side oblong (fig. 1), subreniform, greatest height in the middle and equal to rather less than one half of the length, extremities well rounded and about equal in width; dorsal margin straight or very feebly arched, ventral almost straight, the median sinuation being scarcely perceptible: seen from above (fig. 2) oblong, subovate, abruptly acuminate in front, rounded off behind, width scarcely equalling half the length. Shell-surface smooth, very finely and closely punctated, colour white. Valves equal in size, bordered throughout, except on the hinge-line, with a wide, thick lip which is destitute of the pitted sculpture of the general shell-surface but is marked by numerous transverse hair-like lines (fig. 3): this appearance is, however, seen only in the separated valves and best when viewed by transmitted light. It forms a good diagnostic character.

This species has not to my knowledge been noticed by any Continental author. It may possibly have been sometimes mistaken for the young of *C. candida*, from which, however, it may be at once separated by its evenly rounded extremities and flattened dorsal surface. Nor have I noticed in *C. candida* the delicate pitting of the shell surface which may always be found in *C. lactea*. The soft parts do not disclose any noteworthy characters: the limbs—antennæ especially—are short and stout. The *male* has not been seen. The species is common everywhere in Britain.

CANDONA FRAGILIS Hartwig. (Plate XXIV. figs. 5–10.)

1898. *Candona fragilis* Hartwig, Zool. Anzgr. p. 474.
1900. „ „ G.W. Müller, (5) p. 31, pl. vii. figs. 8–11, 14, 17, 19.

Shell seen laterally oblong, subreniform (fig. 5), greatest height situated in the middle, equal to less than half the length; dorsal margin evenly arched, ventral slightly sinuated in the middle; extremities nearly equal in width and well rounded: seen dorsally the shell is compressed, oblong (fig. 6), widest in the middle, with equally tapered acuminate extremities, width scarcely equal to one third of the length. Shell very thin and fragile; surface smooth, colourless; the extremities slightly fringed with fine hairs. Length 1 mm. The feet of the last pair are non-forcipate and bear three apical setæ, one of which is extremely long (fig. 9); the caudal rami (fig. 10) have two nearly equal terminal claws and a minute marginal seta attached a little beyond the middle of the limb.

I took a single specimen of *C. fragilis* in a roadside pool near Carrick, Co. Donegal, and I am indebted to Dr. Thomas Scott for others taken by him in Scottish lochs—L. Arklet, L. Doon and Forfar loch; but in none of these cases have I found the contained animal in good condition and cannot therefore give complete illustrations of it; females only have been observed in this country.

I did not observe in any of the imperfectly preserved British specimens, the conspicuous processes of the female genital plates, the figure of which (fig. 10) was drawn from a specimen kindly sent to me by Dr. Vávra.

In two of Dr. Scott's specimens I found parasitic organisms which appear to be the scolices of some kind of *Tænia*: one of these is shown in Pl. XXII. figs. 13, 14. The two specimens in which the scolices were found are from different lakes—Loch Arklet and one or other of the two further lakes referred to above, so that it may be fairly inferred that this particular species acts as intermediate host for the *Tænia*. In the 'Cambridge Natural History,' vol. ii. p. 84, several Ostracoda and Copepoda are mentioned as the intermediate hosts of Cestode Worms which attain their final development in the intestines of Birds (Anatidæ), the larval forms belonging to the genus *Cercocystis*. And Professor R. Blanchard has described in the 'Mémoires de la Société Zoologique de France' (1891) a new genus of these worms found in the same group of birds, the scolex of which occurred in an Ostracod ("*Cypris cinerea*" Brady). This species Professor Blanchard calls *Echinocotyle rosseteri*, and it may possibly be identical with that here referred to *. In *E. rosseteri*, however, the crown of hooks is stated to be composed of *ten* spines, whereas in the scolices found in *Candona fragilis* there are, so far as I can make out, *twelve*.

CANDONA FABÆFORMIS Fischer. (Plate XXIV. figs. 11–15.)

1851. *Cypris fabæformis* Fischer, (**9**) p. 146, pl. iii. figs. 6–16.
1870. *Candona diaphana* Brady & Robertson, (**8**) p. 18, pl. v. figs. 1–3.
1889. *Candona fabæformis* Brady & Norman, (**2**) p. 103, pl. ix. figs. 1–4.
1900. *Candona fabæformis* G. W. Müller, (**5**) p. 29, pl. vii. figs. 1–7, 12, 13.

Although W. Hartwig, in a paper on the 'Candoninæ of the Province of Brandenburg' (1901), dissents from our identification of the British specimens with Fischer's *C. fabæformis*, I cannot myself see any sufficient grounds for this dissent. The figures given by Fischer, though incomplete and otherwise not very satisfactory, are not, at any rate, contradictory, and G. W. Müller agrees with Dr. Norman and myself in our conclusion. I here give drawings of some of the more important diagnostic details—the shell only having hitherto been figured from British specimens. The figures are from a specimen taken at Hairmyres, near Glasgow, by the late Dr. D. Robertson.

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* Since these lines were in print I have received from Professor R. Blanchard a note in which, after kindly examining my mountings, he refers these larvæ to *Drepanidotænia anatina* Krabbe.

C. fabæformis, though not by any means a common species, is pretty widely distributed in England, Wales, and Scotland.

CANDONA HYALINA Brady & Robertson. (Plate XXV. figs. 1–5.)

1870. *Candona hyalina* B. & R., (8) p. 18, pl. v. figs. 4–11, pl. ix. figs. 5–8.
1889. *Candona hyalina* Brady & Norman, (2) p. 247.
1900. „ „ G. W. Müller, (5) p. 33, pl. viii. figs. 14–21.

Shell of the *female* (fig. 1) seen laterally, oblong, subreniform, greatest height situated behind the middle and equal to about half the length; anterior extremity rather obtusely rounded, somewhat wider than the posterior, which is however more fully rounded off; dorsal margin well arched, ventral very slightly sinuated in the middle: seen dorsally (fig. 2) the outline is much compressed, elongated, with acutely pointed, nearly equal extremities, the lateral margins evenly curved, greatest width in the middle and equal to one-third of the length. Shell thin and semi-transparent; surface smooth, free from hairs. Length 1·35 mm.

Anterior antennæ slender, the last three joints bearing long apical setæ; posterior antennæ stout, sparingly setiferous; last joint of the last pair of feet bearing three long setæ. Caudal rami (fig. 5) armed with two moderately strong claws of nearly equal length, seta of the dorsal margin as long as the terminal claws and arising a little behind the middle of the limb. Grasping portion of the second maxilla of the *male* not very dissimilar on the two sides, with chisel-like extremities; that of the right side rather larger and stouter than the left (figs. 3, 4).

I have seen but one male specimen of *C. hyalina*—already imperfectly figured in previous papers, the dissection having been a good deal distorted and otherwise injured in preparation. Dr. Thomas Scott, however, records the male as having been taken in Threipmuir reservoir near Balerno, and the female in several Scottish localities. The type specimens are from Barton Broad and other parts of the English Fen-district. I have recently received from Mr. Robert Gurney some which were taken at Sutton in Norfolk. The species has very probably been often recorded as *C. fabæformis*. In my own collection are specimens which have been erroneously so called.

CANDONA BREVIS G. W. Müller. (Plate XXV. figs. 6–12.)

1900. *Candona brevis* G. W. Müller, (5) p. 20, pl. iv. figs. 5, 20, pl. v. figs. 26–30.

1900. *Candona lobipes* Hartwig, Zool. Anzeiger, xxiii. no. 628, p. 570.
1901. *Candona lobipes* Hartwig, (3) p. 94.

Female.—Shell seen from the side (fig. 6) subreniform, greatest height near the posterior extremity and equal to nearly two-thirds of the length; anterior extremity well rounded, posterior gently rounded, almost subtruncate; dorsal margin forming a flattened arch, sloping with a gentle curve to the front, much more abruptly backwards, ventral almost straight: seen from above (fig. 7) the outline is regularly ovate, greatest width equal to much more than half the length. Shell-surface smooth but beset, especially at the ends, with numerous rather long hairs and bearing a few scattered circular papillæ; colour white, but seen by transmitted light, dark brown, almost opaque, with indistinct and irregular areolations which become very evident when the colour-matter is removed by a dilute alkali (fig. 12); ventral border of the valves produced in the middle into a broad flange bearing a pattern composed of a series of strongly marked rectangular tongue-like areas. Length 0·85 mm. Male unknown in Britain.

Anterior antennæ slender and bearing very long, slender setæ; posterior antennæ (fig. 8) nearly devoid of setæ except at the apex which bears three or four setiform claws; first foot having an unusually long terminal claw (fig. 9); second pair of feet not forcipate, bearing three unequal terminal setæ (fig. 10); post-abdominal rami (fig. 11) rather short and stout, with two apical claws and a very small marginal seta situated on the distal third of the limb.

I am greatly indebted to Mr. R. Gurney for several gatherings of Ostracoda from the Norfolk Fen-district, and in one of these —the exact locality not noted—occurred a few examples of this interesting species.

CANDONA PUBESCENS Koch.

1837. *Cypris pubescens* Koch, Deutschlands Crustaceen, H. 11, p. 5.
1838. *Cypris compressa* idem, ibidem, H. 21, p. 17.
1866. *Candona compressa* Brady, (1) p. 382, pl. xxvi. figs. 22-27.
1889. *Candona pubescens* B. & N., (2) Part i. p. 101, pl. xii. figs. 32-37; Part ii. p. 729, pl. lxiii. fig. 24: pl. lxiv. figs. 20, 21; pl. lxviii. figs. 7-9.
1891. *Candona pubescens* Vávra, (6) p. 43, fig. 11.
1900. „ „ G. W. Müller, (5) p. 26, pl. iv. figs. 3, 4, 6, 16, 18, 19, 21, 22.

A widely distributed species both in England and Scotland. I am unable to recognize any specific difference between the two forms *C. pubescens* Koch and *C. compressa* Koch. Vávra (*loc. cit.*) has adopted this view, but by some authors the two species are held to be distinct.

The species is too well known to need further description.

CANDONA ROSTRATA Brady & Norman.

1889. *Candona rostrata* B. & N., (2) p. 101, pl. ix. figs. 11, 12; pl. xii. figs. 21–31.
1891. *Candona rostrata* Vávra, (6) p. 40, fig. 10.
1900. „ „ G. W. Müller, (5) p. 23, pl. v. figs. 2, 3, 7–14.

The much produced anterior beak of the shell forms a very distinctive character, and another good diagnostic point is to be found in the very unequal lengths of the two terminal claws of the caudal rami; this does not occur, so far as I am aware, in any other member of the genus, though Hartwig figures a similar condition in the male of his *C. marchica*, but this species he identifies with the *C. rostrata* of G. W. Müller, and this latter I take to be identical with the *C. rostrata* Brady & Norman. If this be really so, Hartwig's name *C. marchica* has no *locus standi* whatever.

CANDONA EUPLECTELLA Robertson, MS.

1889. *Candona euplectella* Brady & Norman, (2) p. 105, pl. ix. figs. 7, 8, 8*a*.
1900. *Paracandona euplectella* G. W. Müller, (5) pl. ix. figs. 1–9, 14.
1901. *Paracandona euplectella* W. Hartwig, (3) p. 126.

Several Scottish localities for this species were noted in the Monograph of Brady & Norman. In addition to these I have to thank Mr. R. Gurney for specimens from Sutton Broad, Norfolk, and Mr. Scourfield has taken it also in Catfield Fen, Norfolk. It has been recorded in Germany by W. Hartwig and G. W. Müller.

Hartwig, in 1899, proposed to constitute a subgenus* of which *C. euplectella* would be the only known member, the characters of which depended chiefly on the number of joints of the posterior antennæ. But these and other minor characters seem to me too trivial to warrant the separation of a new subgenus.

Genus CANDONOPSIS, Vávra.

This genus was by Vávra separated from *Candona* on the strength of the following characters. The second pair of antennæ are, in the male, six-jointed, and have two "sense organs" on the fourth and fifth joints; the mandibular palp is exceedingly long and slender; the second pair of maxillæ have a branchial appendage of three plumose filaments; the caudal rami are slender and have no setæ on the posterior margin.

These characters were founded on the male only, the female being unknown to Herr Vávra, but they apply likewise to the female. The only hitherto recognized species of the genus is *C. kingsleii* Brady & Robertson.

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* "*Candona euplectella* (Robertson), bildet eine selbständige Gattung," Zoologisch Anzeiger, Bd. xxii. no. 592, 1899.

CANDONOPSIS KINGSLEII Brady & Robertson.

1870. *Candona kingsleii* Brady & Robertson, (8) p. 17, pl. ix. figs. 9–12.
1889. *Candona kingsleii* Brady & Norman, (2) p. 102, pl. ix. figs. 19, 20 (not 21, 22), & pl. xiii. fig. 13.
1891. *Candonopsis kingsleii* Vávra, (6) p. 54, fig. 16.
1900. „ „ G. W. Müller, (5) p. 38, pl. vi. figs. 6, 7, 23–28; pl. vii. figs. 22–25.

This seems to be a widely distributed species. It is of frequent occurrence in the Fen district of England, and in Scotland; perhaps less frequent in other parts of England, but may very possibly have been often confounded with other nearly allied forms. This is undoubtedly the case with some Scottish specimens, which, though supposed to belong to *C. kingsleii*, are really *Candona protzi*. Others belong to the form here described as *Candona caledoniæ*.

CANDONOPSIS SCOURFIELDI, sp. n. (Plate XXVI. figs. 1–12.)

Male.—Length 0·85 mm. Shell, seen from the side, oblong, subreniform (fig. 1), greatest height situated in the middle and equal to rather less than half the length, extremities equally and evenly rounded; dorsal margin gently arched, sloping gradually towards each extremity, ventral almost straight: seen dorsally (fig. 2) the outline is much compressed, widest in the middle, the width being equal to one-fourth of the length, extremities sharply produced, acuminate. Surface of the shell smooth, slightly hairy near the extremities; the free margins of the valves when seen by transmitted light are marked with a single row of minute dark pigment spots (fig. 12). Anterior antennæ slender, six-jointed, the last four joints provided with long, delicate setæ; posterior antennæ five-jointed (fig. 3), the basal joint bearing a slender triarticulate sense-organ (fig. 4), second joint having at the extremity of its inner margin a single long seta which reaches considerably beyond the apex of the limb, third joint provided with a fascicle of three short setæ, fourth and fifth joints each bearing two stout setæ but no claws; mandible-palp elongated, and otherwise having the typical characters of the genus (fig. 5); second pair of maxillæ prehensile, clawed, that of the right side the more robust (fig. 6); second pair of feet bearing at the apex (fig. 8) two setæ of unequal length. Caudal rami very slender (fig. 9), the two terminal claws not quite equal in length, no marginal seta: the penis rather small and compact, oblong, with two subtriangular apical laminæ (fig. 10); ejaculatory duct very broad and massive, enclosed in a dense, transversely striated capsule (fig. 11). The *female* does not differ materially from the male except in purely sexual characters.

I am indebted to my friend Mr. D. J. Scourfield for two specimens—male and female—of this very interesting species. They were taken in Catfield Fen, Norfolk.

Genus SIPHLOCANDONA *, gen. n.

Shell elongated, elliptical, thin and fragile. Posterior legs almost obsolete, their place being taken by an ill-developed club-shaped appendage. Caudal rami of the usual form, armed with two terminal claws and a very small marginal seta situated almost close to the distal extremity: of the two claws that situated above (or nearer the dorsal surface) is much the larger of the two. In other respects like *Candona.*

SIPHLOCANDONA SIMILIS Baird. (Plate XXVII. figs. 1–9.)

1845. *Candona similis* Baird, (7) p. 162, pl. xix. figs. 2, 2 *a* (1850); Trans. Berw. Nat. Club, ii. p. 153 (1845); Ann. & Mag. Nat. Hist. xvii. p. 415, pl. ix. fig. 4.

Female.—Shell, seen laterally, elongated, subelliptical, rather higher in front than behind (fig. 1), length equal to more than twice the height; extremities well rounded, the anterior the broader of the two; dorsal margin quite straight, ventral gently sinuated in the middle: seen from above (fig. 2) the outline is elongate-ovate, widest in the middle, nearly twice as long as broad, lateral margins evenly arcuate and tapering equally to the extremities which are sharply pointed. Shell very thin and fragile and showing no trace of sculpture; almost colourless. Valves equal, their margins scarcely at all inflexed. Length 0·98 mm.

Anterior antennæ six-jointed, slender, their terminal setæ long and slender; posterior antennæ four-jointed, moderately stout (fig. 3); mandibles (fig. 4) bearing a stout four-jointed palp the first joint of which is provided with a 4-setose branchial plate; first and second pairs of maxillæ of the usual form (figs. 5, 6); feet of the first pair (fig. 7) four-jointed, inner margin of the second joint rather densely setose, last joint bearing two very unequally sized claws and a short seta: the homologue of the last limb is a short, slightly curved, club-shaped process with a small proboscidiform apex (fig. 8). Caudal rami simple, straight, with smooth, non-setose margins, bearing two terminal claws, the uppermost quite twice as long as the lower; marginal seta very small and situated almost close to the apical claw (fig. 9). Male unknown.

This species, which, though collected in 1897, has remained unrecognized until now, is, I have little doubt, identical with that described long ago by Dr. Baird under the name of *Candona similis*, his description and figures agreeing in every particular with my specimens. These, of which I took only a very small number—some three or four—are from "the Mere" at Scarborough, a small sheet of fresh water lying under Oliver's Mount, and I have more recently received specimens from Mr. Robert Gurney, taken in Catfield Fen, Norfolk.

The characters which essentially distinguish this genus from other Candoninæ, are the atrophied posterior foot, and the abnormal structure of the caudal rami, the terminal claws of which differ in their comparative size from those of other species, the uppermost of the two being much the larger, and the marginal seta is closely approximated to the claws.

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* *σιφλὸς*, a cripple.

In addition to the type species, I have recently detected in a Scotch mounting kindly sent to me by my friend the Rev. Canon Norman, a few specimens of another form distinct from *S. similis*, but undoubtedly belonging to the same genus: this I propose to name *S. normani*.

SIPHLOCANDONA NORMANI, sp. n. (Plate XXVII. figs. 10–14.)

Shell, seen laterally, compressed, oblong, siliquose (fig. 9), greatest height situated in the middle, not nearly equal to half the length; extremities narrowly rounded, the posterior somewhat oblique; dorsal margin gently and evenly arched, ventral slightly prominent in front, gently sinuated behind: seen from above (fig. 10), compressed, subovate, greatest width equal to the height and situated in the middle, gradually tapered to the extremities, which are acuminate: surface of the shell smooth, colour milk-white. Length 0·8 mm. Claws of the caudal rami stout (fig. 14), the uppermost more than twice as long as the lower; the marginal seta short, stout, and claw-like, closely approximated to the terminal claws.

The only specimens of this curious species which I have seen were included in a series of *Candonopsis kingsleii*, from which, indeed, it was not very easy to distinguish them. They were taken by the Rev. Canon Norman in pools near the margin of Loch Fadd, Isle of Bute.

Subfam. HERPETOCYPRIDINÆ.

Genus HERPETOCYPRIS Brady & Norman.

HERPETOCYPRIS REPTANS Baird.

1850. *Candona reptans* Baird, (7) p. 160, pl. xix. figs. 3, 3 *a*.
1889. *Erpetocypris reptans* Brady & Norman, (2) Part i. p. 84, pl. xiii. fig. 27.
1891. *Cypris reptans* Vávra, (6) p. 86, fig. 28. 1–5.
1900. *Herpetocypris reptans* Kaufmann, (4) p. 282, pl. xvi. figs. 1–3, pl. xviii. figs. 21–26.
1900. *Cypris reptans* G. W. Müller, (5) p. 58, pl. xiv. figs. 4, 6, 12, 13, 17.

The most abundant and apparently the most widely distributed species of this subfamily—found everywhere in Great Britain, in Scandinavia, and all over the continent of Europe.

HERPETOCYPRIS CHEVREUXII G. O. Sars. (Plate XXIX. figs. 1–7.)

Stenocypris chevreuxii G. O. Sars, "On a new fresh-water Ostracod, &c." (Archiv f. Mathem. og Naturvidenskab, 1896).

Shell, seen laterally (fig. 1), oblong, of nearly equal height throughout, height equal to less than half the length; extremities well rounded and nearly equal in width; dorsal margin almost straight, curving gently downwards toward the extremities, ventral slightly sinuated in the middle: seen dorsally (fig. 2), the outline is compressed, subovate, widest behind the middle, rather acutely pointed in front, more obtuse and more abruptly tapered behind; width equal to about one-third of the length: left valve larger than the right and infolded at both extremities so as to form an overlapping flange *; surface of the shell smooth; colour a clouded green with lighter patches. Length 2·55 mm. ($\frac{1}{10}$ in.).

The antennal setæ are beautifully plumose and reach to the extremities of the terminal claws (fig. 3); the lobe of the first maxilla next following the palp has two of its claws laterally denticulated and terminating in a spear-head (fig. 5); palp of the second maxilla (fig. 4) narrow and elongated, masticating portion twisted upon itself toward the base; posterior legs of the usual form (fig. 6), the last joint small, divided into three distorted finger-like lobes, bearing a single long seta and a strongly falcate claw. Caudal rami (fig. 7) slender, bearing two unequal, strong, apical claws which are marginally pectinated, and two setæ, a small one on the dorsal and a much longer one on the lower angle; the dorsal margin of the ramus is ornamented at its distal end with about four series of delicate spines separated from each other by slight depressions of the margin; these spinules, reduced very much in size, are continued without intermission along the proximal portion of the limb.

This is so closely allied in general form and characters to the foregoing species, *H. reptans*, that it seems to me undesirable to assign it to a distinct genus (*Stenocypris*) as has been proposed by Professor G. O. Sars, especially as the variations in anatomical points are comparatively unimportant.

A single specimen was taken many years ago at Lyndhurst, and remained in my collection unnamed and without description. Since that time I have found it in considerable abundance in the Hatchett Pond (New Forest), in ditches near the River Arun (Sussex), in Conway Marsh (North Wales), and in a pond near Sellafield (Cumberland).

HERPETOCYPRIS STRIGATA O. F. Müller. (Plate XXVIII. figs. 4–9.)

1889. *Erpetocypris strigata* Brady & Norman, (2) p. 85, pl. viii. figs. 14, 15.
1891. *Erpetocypris strigata* Vávra, (6) p. 84, fig. 27.
1900. *Cypris strigata* G. W. Müller, (5) p. 74, pl. xv. figs. 11–13, 19, 20.

Shell, seen laterally, oblong, subreniform, height equal to nearly half the length; anterior extremity obtusely rounded, posterior narrower, rounded off obliquely; dorsal margin forming a some-

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* These duplicatures occur also on the right valve but are much less conspicuous.

what flattened arch, ventral gently sinuated in the middle: seen dorsally it is compressed, subovate, widest in the middle, with equal acuminate extremities. Length 2·7 mm. The posterior antenna bears a fascicle of six very short setæ, and its terminal claws are slender and finely pectinated (fig. 6); the two principal claws of the first maxillar segment are club-shaped (fig. 7) and have blunt, terminal denticulations; last joint of the second pair of feet forcipate, bearing at the apex a slender curved claw and one long seta, the penultimate joint forming distally on its inner margin a convex pad which is fringed with a series of curved bristles, on its outer margin a small finger-like ciliated process (fig. 8). Caudal rami slender, bearing just within the upper margin along the greater part of their length an interrupted series of minute cilia; terminal claws unequal in length, delicately pectinated, the marginal seta almost close to the apical claws (fig. 9).

Not infrequent in Scotland; less common in England. Noted also by several Continental authors.

Genus PRIONOCYPRIS Brady & Norman.

PRIONOCYPRIS SERRATA Norman. (Plate XXV. figs. 13–16.)

1866. *Cypris serrata* Brady, (1) p. 371, pl. xxv. figs. 15–19, pl. xxxvi. fig. 3.
1896. *Prionocypris serrata* Brady & Norman, (2) p. 725.
1900. *Cypris serrata* G. W. Müller, (5) p. 72, pl. xiv. figs. 3, 11, 14.
1900. *Prionocypris serrata* Kaufmann, (4) p. 292, pl. xx. figs. 10–12, pl. xxi. figs. 22–26.

A very distinct and well-marked species, far different in shell-characters from any other fresh-water form. There are also several minor abnormalities in the structure of the contained animal which seem to warrant the use of the generic name proposed in 1896 by Brady and Norman (*loc. cit.*). The more important distinctive characters are: (1) the extremely short antennal setæ; (2) the smoothly edged claws of the outer lobe of the first maxillæ, and the dilated extremity of the palp; (3) the perfectly smooth margins of the very slender caudal rami, and the position of the dorsal seta very near to the apical claws; (4) the simple termination of the second pair of feet which bear on the small terminal joint only two setæ, one long, and one short and claw-like.

The species is nowhere common, but is widely distributed in England. It does not seem to have been found in Scotland or Ireland, but is noticed by several Continental authors. In addition to localities already published I have taken it in a backwater of the River Wye at Rowsley, Derbyshire, and Mr. Scourfield records it from reservoirs at Walthamstow and Purfleet, Essex.

The generic characters mentioned above, though none of them separately very important, may, together with the exceptionally marked characters of the shell, be taken as sufficient to warrant the separation of the species as the type of a distinct genus.

PRIONOCYPRIS TUMEFACTA Brady & Robertson. (Plate XXVIII. figs. 1-3.)

1870. *Cypris tumefacta* Brady & Robertson, Ostracoda and Foraminifera of Tidal Rivers (Ann. & Mag. Nat. Hist. ser. 4, vol. vi.) p. 13, pl. iv. figs. 4-6.
1889. *Erpetocypris tumefacta* Brady & Norman, (2) Part i. p. 87, pl. viii. figs. 5-7, pl. xiii. fig. 18.
1900. *Cypris tumefacta* G. W. Müller, (5) p. 73, pl. xvii. figs. 4, 8, 13.
1900. *Prionocypris tumefacta* Kaufmann, (4) p. 295, pl. xvi. figs. 13-15, pl. xxi. figs. 9-13.

Shell, seen laterally, subreniform, highest in the middle, height greater than half the length; extremities rounded, the posterior much the broader of the two; dorsal margin arched, sloping more abruptly behind than in front: seen from above the outline is ovate, excessively tumid, width equal to two-thirds of the length; anterior extremity abruptly tapered and forming a mucronate prominence, posterior broadly rounded; the two valves are nearly equal in size but have the two extremities and, in a smaller degree, the ventral margin incurved so as to form a very conspicuous flange or duplicature (fig. 1). Shell-surface quite smooth, colour white. Length 1·05 mm.

Setæ of the posterior antennæ very short, arranged in a distinct fascicle of four (fig. 2); caudal rami (fig. 3) slender, the two terminal claws equal in length, and almost imperceptibly pectinated, marginal seta very small and not far removed from the claws.

A very well marked species, recognizable at a glance by its excessive tumidity and produced anterior extremity. The internal duplicature of the margins of the valves is more pronounced than in any other species known to me.

I have taken it in the Warn Burn, Northumberland, near Sunderland, and in the River Lathkill, Derbyshire; it has been found also by the late Dr. Robertson and by Dr. Thos. Scott in several Scottish localities.

Genus ILYODROMUS G. O. Sars.

Shell highly compressed, and, seen laterally, oblong; dorsal edge straight in the middle, ventral sinuated. Valves generally not very unequal, the left the larger; surface usually longitudinally striated. Setæ of the inferior antennæ poorly developed, not reaching beyond the terminal claws. Caudal rami coarse, armed with three strong claws increasing in length distally. Animal devoid of swimming power. Propagation parthenogenetical.

This generic definition is slightly condensed from that given by G. O. Sars in a paper on the "Freshwater Entomostraca of New Zealand," 1894. As applying to the British species, the statements as to the straight dorsal edge and longitudinal striation of the valves must be eliminated, but in other respects the generic definition is perfectly applicable. Whether the fact of the three-clawed caudal ramus is sufficiently important to call for separation from *Herpetocypris* may perhaps be doubted, but it seems to be the only distinctive character, if we except the not very important matter of shell-sculpture; from *Candona*, on the other hand, it is differentiated by the anatomical structures connected with "parthenogenetic" propagation, as well as by the presence, apparently, in the type species, of a setose fascicle on the posterior antennæ. The two British species at present known are *Ilyodromus olivaceus* and *I. robertsoni*.

ILYODROMUS ROBERTSONI Brady & Norman. (Plate XXVIII. figs. 10–15; Plate XXIX. fig. 12.)

1889. *Erpetocypris robertsoni* Brady & Norman, (2) Part i. p. 88.

1896. *Ilyodromus robertsoni* Brady & Norman, (2) Part ii. p. 724.

Length 1·6 mm. Shell oblong, subovate; seen laterally, oblong, subreniform (Pl. XXVIII. fig. 10), greatest height behind the middle and equal to about half the length; anterior extremity broadly and rather obliquely rounded, posterior also rounded but narrower than the anterior; dorsal margin boldly arched, sloping gently toward the point, more steeply backward, ventral margin slightly sinuated: seen from above (fig. 11) the outline is compressed, ovate, width much less than half the length, obtusely pointed in front, rounded off behind. Shell-surface smooth; colour variable, but generally dark green with mottled patches of lighter shades: left valve larger than the right and overlapping distinctly at the two extremities; the anterior margin rather densely clothed with long hairs, ventral margin slightly hairy: general surface of the shell structureless, but marked with distant, very minute, circular punctures. The posterior antennæ (fig. 12) are very sparingly provided with short setæ and have no distinct fascicle; palp of the posterior maxilla (Pl. XXIX. fig. 12) narrow and bearing three apical setæ; two principal spines of the first lobe of the anterior maxilla finely denticulated (Pl. XXVIII. fig. 15); terminal joint of the last leg (fig. 13) small, bearing a slender falcate claw; penultimate joint with a long seta near the apex. Caudal rami (fig. 14) with three stout terminal claws progressively increasing in length towards the apex, a single slender seta adjoining the last claw.

The types of *I. robertsoni* were taken at Hayston Dam near Peebles and at Portree, Isle of Skye. I have myself taken it in a pool on Loughrigg, Westmorland, in a roadside pool near Carrick, Co. Donegal, and in a ditch near Staward, Northumberland. It does not seem to have been observed by any Continental authors.

Ilyodromus olivaceus Brady & Norman. (Plate XXIX. figs. 8–11.)

1889. *Erpetocypris olivacea* Brady & Norman, (2) Part i. p. 89, pl. viii. figs. 3, 4.
1891. *Ilyodromus olivaceus* Vávra, (6) p. 88, fig. 29. 1–4.
1896. *Ilyodromus olivaceus* Brady & Norman, (2) Part ii. p. 724.
1900. *Ilyodromus olivaceus* Kaufmann, (4) p. 299, pl. xx. figs. 7–9, pl. xxi. figs. 17–21.

It is needless to repeat the descriptions already given (*loc. cit.*) of this species, but, for the sake of comparison with the closely allied *I. robertsoni*, I give drawings of some of the more characteristic parts of the animal. The types of *I. olivaceus* were found in the River Lathkill, Derbyshire. It has since been taken by Dr. T. Scott in several Scottish localities, and has also been recorded by Dr. Kaufmann as occurring in Switzerland, by Dr. Vávra in Bohemia, and at Moscow by Croneberg.

The works referred to by numerals in the text are as follows:—

(1) Brady, G. S.—A Monograph of the recent British Ostracoda (Transactions of the Linnean Society, vol. xxvi.), 1866.

(2) Brady, G. S., & Norman, A. M.—A Monograph of the Marine and Freshwater Ostracoda of the North Atlantic and of North-Western Europe. Section I. Podocopa. (Scientific Transactions of the Royal Dublin Society, vol. iv. series ii.), 1889. Part ii. Myodocopa, Cladocopa, and Platycopa, 1896.

(3) Hartwig, W.—Ueber die Arten der Ostracoder Unterfamilie Candoninæ der Provinz Brandenburg (Sitzungs-Bericht der Gesellschaft Naturforschender Freunde zu Berlin), 1902.

(4) Kaufmann, A.—Cypriden und Darwinuliden der Schweiz (Revue Suisse de Zoologie), 1900.

(5) Müller, G. W.—Deutschlands Süsswasser-Ostracoden. Stuttgart, 1900.

(6) Vávra, Wenzel.—Monographie der Ostracoden Böhmens (Archiv der Naturwissensch. Landesdurchforschung von Böhmen), 1891.

(7) Baird.—Natural History of the British Entomostraca (Ray Society), 1850.

(8) Brady, G. S., & Robertson, D.—The Ostracoda and Foraminifera of Tidal Rivers (Ann. & Mag. Nat. Hist. ser. 4, vol. vi.), 1870.

(9) Fischer, S.—Ueber das Genus *Cypris* (Mémoires des Savants étrangers, t. vii.), 1851.

(10) Scott, T.—A Catalogue of Land, Fresh-water, and Marine Crustacea found in the Basin of the River Forth and its Estuary. 1906.

EXPLANATION OF THE PLATES.

Plate XIX.

Candona candida.

Figs. 1, 2. Shell of female, seen laterally and dorsally, × 40.
3, 4. „ „ junr., seen laterally and dorsally, × 55.
5. Posterior antenna, × 140.
6. Mandible, × 125.
7, 8. Second maxilla of male, left and right side, × 140.
9. Foot of second pair, × 125.
10. Caudal ramus of male, × 140.
11. Copulatory organ of male, × 110.

Candona caudata.

Figs. 12, 13. Shell of female, seen laterally and dorsally, × 40.
14. Posterior ventral angle of shell, × 84.
15. Posterior antenna, × 120.

Plate XX.

Candona angulata.

Figs. 1, 2. Shell of male, seen laterally and dorsally, × 40.
3. „ female, seen laterally, × 40.
4, 5. Second maxilla of male, right and left, × 125.
6. End of foot of second pair, × 125.
7. Caudal ramus, × 84.
8. Copulative organ of male, × 84.
9. Parasite, × 84.
10. Parasitic cysts on shell, × 10.

Candona caudata.

Fig. 11. Anterior antenna, × 120.
12. End of foot of second pair, × 125.
13. Caudal ramus with genital lobe of female, × 120.

Plate XXI.

Candona neglecta.

Figs. 1, 2. Shell of male, seen laterally and dorsally, × 30.
3, 4. „ female „ „ „ × 30.
5, 6. Second maxilla of male, left and right, × 140.
7. Caudal ramus, × 100.
8. Copulative organ of male, × 100.

Candona siliquosa.

Figs. 9, 10. Shell of female, seen laterally and dorsally, × 40.
11. Anterior antenna, × 125.
12. End of foot of second pair, × 125.
13. Caudal ramus and genital lobe of female, × 125.
14. Muscle-spots, × 125.

Plate XXII.

Candona elongata.

Figs. 1, 2. Shell of female, seen laterally and dorsally, × 40.
3. Anterior antenna, × 240.
4. Posterior antenna, × 180.
5. Mandible, × 240.
6. Foot of first pair, × 180.
7. „ second pair, × 240.
8. Caudal ramus, × 240.

Candona siliquosa.

Fig. 9. Posterior antenna, × 180.
10. Foot of first pair, × 180.

Candona stagnalis.

Fig. 11. Shell of female, seen from right side, × 50.
12. Caudal ramus, × 240.

Candona fragilis.

Fig. 13. Scolex of *Tænia* from *Candona fragilis*, × 120.
14. Crown of hooks of the same, × 350.

Plate XXIII.

Candona protzi.

Figs. 1, 2. Shell of male, seen laterally and dorsally, × 50.
3. „ „ female „ „ „ × 50.
4. Anterior antenna, × 125.
5. Posterior antenna, × 240.
6, 7. Second maxilla of male, left and right, × 240.
8. Caudal ramus, × 150.

Candona caledoniæ.

Figs. 9, 10. Shell of female, seen laterally and dorsally, × 50.
11. Posterior antenna, × 240.
12. Mandibular palp, × 240.
13. End of foot of second pair, × 140.
14. Caudal ramus, × 240.

Plate XXIV.

Candona lactea.

Figs. 1, 2. Shell, seen laterally and dorsally, × 65.
3. Portion of shell, × 150.
4. Caudal ramus, × 150.

Candona fragilis.

Figs. 5, 6. Shell of female, seen laterally and dorsally, × 40.
7. Posterior antenna, × 240.
8. Posterior maxilla of female, × 240.
9. End of foot of second pair, × 240.
10. Caudal rami with genital processes of female, × 140.

Candona fabæformis.

Fig. 11. Anterior antenna, × 125.
12, 13. Second maxillæ of male, left and right, × 125.
14. Caudal ramus, × 125.
15. Copulative organ of male, × 125.

Plate XXV.

Candona hyalina.

Figs. 1, 2. Shell of female, seen laterally and dorsally, × 40.
3, 4. Second maxillæ of male, right and left, × 125.
5. Caudal ramus, × 240.

Candona brevis.

Figs. 6, 7. Shell of female, seen laterally and dorsally, × 50.
8. Posterior antenna, × 120.
9. Foot of first pair, × 120.
10. „ second pair, × 120.
11. Caudal ramus, × 120.
12. Shell structure, × 125.

Prionocypris serrata.

Fig. 13. Posterior antenna, × 140.
14. Maxilla of first pair, × 240.
15. Foot of second pair, end, × 240.
16. Caudal ramus, × 140.

PLATE XXVI.

Candonopsis scourfieldi.

Figs. 1, 2. Shell seen laterally and dorsally, × 65.
3. Posterior antenna, × 240.
4. Sense-organ of same, × 350.
5. Mandible, × 540.
6, 7. Second maxillæ of male, right and left, × 240.
8. End of foot of second pair, × 240.
9. Caudal ramus, × 150.
10. Copulative organ of male, × 150.
11. Ejaculatory duct of male, × 240.
12. Ventral edge of shell, × 125.

PLATE XXVII.

Siphlocandona similis.

Figs. 1, 2. Shell seen laterally and dorsally, × 50.
3. Posterior antenna, × 150.
4. Mandible, × 150.
5. Maxilla of first pair, × 240.
6. „ second pair, × 200.
7. Foot of first pair, × 240.
8. „ second pair, × 240.
9. Caudal ramus, × 240.

Siphlocandona normani.

Figs. 10, 11. Shell seen laterally and dorsally, × 55.
12. Foot of first pair, × 240.
13. „ second pair, × 240.
14. Caudal ramus, × 240.

PLATE XXVIII.

Prionocypris tumefacta.

Fig. 1. Left valve seen from inside, × 50.
2. End of posterior antenna, × 240.
3. Caudal ramus, × 240.

Herpetocypris strigata.

Figs. 4, 5. Shell seen laterally and dorsally, × 16.
6. Posterior antenna, × 84.
7. Tooth of first maxilla, × 350.
8. End of foot of second pair, × 240.
9. Caudal ramus, × 84.

Ilyodromus robertsoni.

Figs. 10, 11. Shell seen laterally and dorsally, × 30.
12. Posterior antenna, × 140.
13. End of foot of second pair, × 240.
14. Caudal ramus, × 140.
15. Tooth of anterior maxilla, × 240.

PLATE XXIX.

Herpetocypris chevreuxii.

Figs. 1, 2. Shell seen laterally and dorsally, × 20.
3. Posterior antenna, × 84.
4. „ maxilla, × 84.
5. Tooth of anterior maxilla, × 300.
6. End of foot of second pair, × 240.
7. Caudal ramus, × 120.
7 *a*. Marginal spines of same, × 240.

Ilyodromus olivaceus.

Fig. 8. Posterior antenna, × 120.
9. Foot of first pair, × 84.
10. „ second pair, end, × 210.
11. Caudal ramus, × 84.

Ilyodromus robertsoni.

Fig. 12. Posterior maxilla, × 200.

PLATE XXX.

Fig. 1. Shell of *Candona angulata* with encysted trematodes.
2–4. Cysts of the above in various stages of development.
5. *Neorhynchus* (? *clavaeceps* Zad.).

P. Proboscis. *L*. Lemnisci. *S.C L*. Subcuticular layer. *R*. Retractor of proboscis. *G.N*. Giant nucleus. *T*. Testis. *V.D*. Vas deferens. *G*. Glands. *G.P*. Genital pore.

5. A Contribution to the Anatomy of *Hippopotamus amphibius*. By FRANK E. BEDDARD, M.A., F.R.S., F.Z.S., Prosector to the Society.

[Received January 18, 1910.]

(Text-figures 22–25.)

Our knowledge of the anatomy of this animal so far as the viscera are concerned is due principally to the great work of Gratiolet[*], and to shorter and more recent memoirs by Crisp[†], Clark[‡], Garrod[§], Flower[||], Alix[¶], Chapman[**], Weber[††], Peters[‡‡], as well as to Dr. Macalister's[§§] memoir upon the Liberian Hippopotamus.

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[*] Recherches sur l'Anatomie de l'Hippopotame. Ed. by Alix. Paris, 1867.

[†] "On some Points connected with the Anatomy of the Hippopotamus," P. Z. S. 1867, p. 601.

[‡] "Notes on the Visceral Anatomy of the Hippopotamus," P. Z. S. 1872, p. 185.

[§] "On the Brain and other parts of the Hippopotamus," Trans. Zool. Soc. xi. p. 11.

[||] "Lectures on the Digestive Organs of Mammals," Med. Times & Gazette, 1872.

[¶] "Sur la Glande lacrymale de l'Hippopotame," Bull. Soc. Philom. Paris (7) iii. 1879, p. 146. "Sur le Plexus cervicale," *ib.* p. 167. "Sur le Glande Sympathique de l'Hippopotame," *ib.* p. 168. "Sur la Glande lacrymale de l'Hippopotame," Bull. Soc. Zool. Fr. iv. 1879, p. 117.

[**] "Observations upon the Hippopotamus," P. Acad. Philad. 1881, p. 126.

[††] Studien über Säugethiere: i. Beiträge zur Anatomie von *Hippopotamus amphibius*. Jena, 1886.

[‡‡] In 'Reise nach Mossambique,' Saügethiere, 1852, p. 180.

[§§] "The Anatomy of *Chœropus liberiensis*," P. Roy. Irish Acad. (2) i. 1874, p. 496.

These numerous memoirs between them deal with all the organs of the body. The recent dissection of a male specimen which died in the Society's Gardens has enabled me to verify a number of the recorded facts, and also to add some few details to our knowledge of the anatomy of the Hippopotamus. In particular, I believe that I am able to compare more satisfactorily than has yet been done the intestinal tract of this animal with that of its allies.

When the animal is cut open the stomach is seen to occupy the greater part of the abdominal cavity; it completely hides the liver, which is behind it. A transversely running section of the colon is nearly all that is visible of that gut, and it lies between sections of the small intestine. The only part of the gut upon which I made observations worth recording as a contribution to our knowledge of the anatomy of this animal, was the colon. Of this section of the gut Gratiolet* wrote: "Le côlon ascendant décrit une ligne sineueuse dans laquelle en peut compter six anses successives. Il y a ensuite un côlon transverse, une S iliaque médiocrement courbée, placée très-près de la ligne médiane, et enfin un rectum très-musculeux." This description is not in the present state of our knowledge of the mammalian gut enough to indicate the relationships with other Artiodactyles. Dr. Crisp figures the entire alimentary canal of this Pachyderm, but gives so generalised a figure that no details can be ascertained beyond the well-known absence of cæcum, and the proportions, roughly speaking, between the long small and the short large intestine.

The figure of Gratiolet is better, and represents some of the essential features of this gut in the Hippopotamus as I would interpret them. The six successive loops of the colon are given in his illustration, and then the sharp bend backwards to form the straight running descending colon and rectum. According to Flower, "The colon is comparatively short, about one-tenth of the whole intestine, and instead of the spiral convolution found in most Artiodactyles, its first or ascending part is thrown into about six transverse folds, and then it pursues the usual course of the transverse and descending colon." This description agrees entirely with the figure of Gratiolet. There are, as I believe, no further notes upon the alimentary canal of the Hippopotamus tending to explain its relations to and differences from the alimentary canal of other Artiodactyles, save a brief reference by Dr. Mitchell in his comparative survey of the Mammalian gut†. The colon of the example of *Hippopotamus* which I have myself examined appeared to be like that of other examples; but my own observations enable me to add some details which serve to fix more plainly, as I think, the correspondence between the colon of this animal and that of others among its allies. It is to be noted, in the first place, that the colon has, to begin with, a descending direction. Its origin from the small intestine—though, as is well known, there is no cæcum—is quite marked, and cannot be missed. This descending origin is decidedly on the left side of the body, the origin of the duodenum on the right side really occupying the position so often seen in mammals to be occupied by the cæcum. The first part of the colon is quite loosely arranged, and although six tolerably regular folds are figured by Gratiolet, it must not be inferred from the stress laid upon these folds by him and by Flower, that they are definite entities. On the contrary, the colon is in this region entirely lax and can be passed through the fingers in a perfectly straight line without in the least damaging the mesocolon by which it is suspended. There is, in fact, no really definite series of colic loops. The colon happens to lie in this way or that to meet the conditions of space; but it is as free from any ansæ coli as is that of the Primates or the Marsupialia, &c.

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* *Loc. cit.* p. 305.

† Trans. Zool. Soc. vol. xvii.

We have to note therefore, in the first place, that *Hippopotamus* in the arrangement of the gut is more primitive than is any other Artiodactyle, or indeed than any other Ungulate, excepting perhaps the Elephant. In surveying the various Orders of Mammals with reference to the coiling of the gut [*], I was unable to find any Artiodactyle which had not a very specialised gut. Even *Tragulus*, which lies near to the base of the series, so far as living Artiodactyles are concerned, showed all the typical artiodactyle features in the arrangement of its colon and in the permanent loops thereof. The animal therefore furnishes additional evidence in favour of the contention that the gut undergoes an evolution in separate groups, the stages being in all cases the same in general outline. A knowledge of the intestinal tract of the Hippopotamus thus fills a very considerable hiatus in what is known concerning the group of Artiodactyles.

It is, however, important to notice that while the gut of the Hippopotamus represents Stage II. among the Artiodactyles [†], a stage which has been hitherto missing in that group, there is not a precise correspondence between the gut and that of, for example, a Kangaroo which represents the same stage. The intestinal tract of *Hippopotamus* is distinctively Artiodactyle, or at least Ungulate, in various features to which I now shall direct attention. In the first place, the position of the vanished cæcum is on the left side of the body, and the colon therefore commences by passing in a downward direction. This is precisely what we find in other Ungulates, for example in *Hyrax* [‡]. The second feature of importance in which the gut shows an Ungulate, and this time a distinctively Artiodactyle, character, is in the sharp turn of the ascending to form the descending colon. This is particularly well seen in, for instance, *Tragulus*. But it occurs in other Artiodactyles also.

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[*] "On the Anatomy of *Antechinomys*, &c.," P. Z. S. 1908, p. 561.

[†] I am not absolutely certain whether the gut of *Hippopotamus* may not really belong to Stage I. Gratiolet speaks of a continuous mesentery for both small and large intestine. Unfortunately my own notes are defective as to this point.

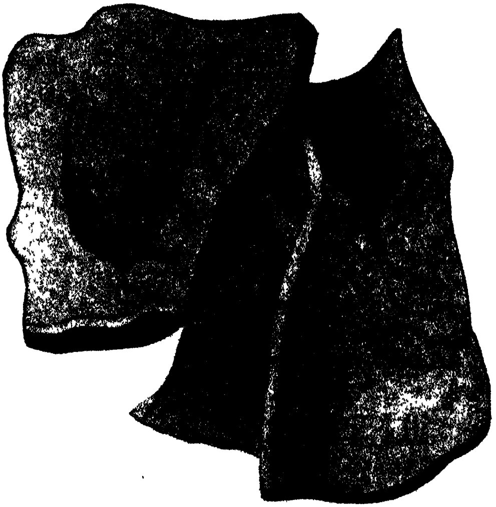
[‡] See Beddard, "On the Anatomy of *Antechinomys*, &c.," P. Z. S. 1908, p. 582, fig. 115.

The enormous stomach of the Hippopotamus has been described by so many writers, indeed by all those quoted above as well as by some earlier contributors to our knowledge of this "Pachyderm," such as Daubenton. The various chambers of the stomach seem to be now well understood, and in consequence I have not troubled myself to revise the existing knowledge upon this subject. But one matter which I noted in connection with that organ has not been dwelt upon by previous writers. If it has been noted at all, it has escaped my attention. I found in the case of the young animal which I examined, that along a line parallel with the elongated spleen and about coextensive with that organ, the stomach was attached to the ventral parietes by a strong white band of connective tissue. The direction of this was rather obliquely longitudinal, being somewhat between the transverse and the longitudinal planes of the body. On the opposite side of the body the stomach was attached to the dorsal parietes by an equally strong ligament. This latter may, of course, be regarded as the mesogaster. But the homologies of the ventral ligament are not so clear.

I showed the structure to my colleague Dr. Plimmer, who was of opinion that the ligamentous band was not a pathological structure, and indeed it hardly gave the impression of being of that nature. It may perhaps be regarded as representing a portion of the ventral mesentery, of which in other mammals the falciform ligament is the only representative. In the case of the Hippopotamus, however, the direction of this ligament was not quite such as to lead to a confident assertion of this view of its homology. The attachment of the stomach to the ventral parietes is, I believe, a new structural feature for a mammal. It obviously reveals the conditions which obtain in the Crocodilia (and in Birds). The fixation of so huge an organ as is the stomach of this great beast when distended with food would seem to be a most useful fact in its economy, and it is possibly to be looked upon in this light. For one can hardly make the comparison suggested with the aquatic Crocodilia save as due to a like need.

The *heart* in the example which I have studied does not show any marked bifidity of its apex such as has been described in this animal. Indeed nothing of the kind was obvious to me. As Gratiolet has observed, there are no corpora Arantii in the valves of the pulmonary artery. These nodules are also absent from the same valves in the Peccary. The accompanying drawing (text-fig. 22, p. 224) illustrates the interior of the aorta and pulmonary artery, and shows the crescentic depression in each which represents the former orifice of the ductus Botalli. It will be noted that, in accordance with the direction of the tube (which is a solid band in the adult and indicated in the figures already referred to), the rudimentary orifice is thickened along one side; *b* is the aortic orifice, *a* that in the pulmonary artery.

Text-fig. 22.

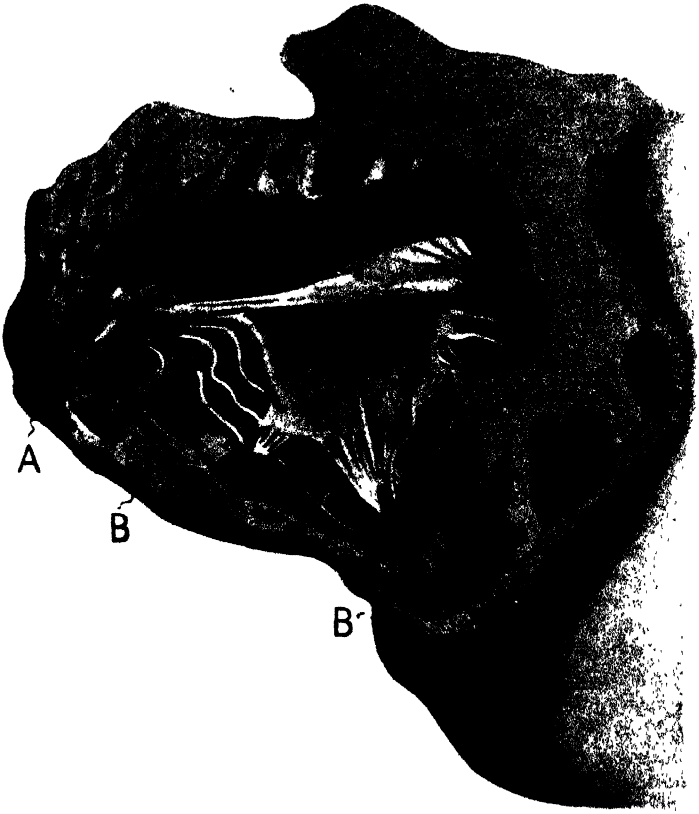


The aorta and pulmonary artery of *Hippopotamus* opened up to show the vestigial orifices (*a* & *b*) of the ductus Botalli.

The *right ventricle* fully opened is shown in text-fig. 23. It will be observed from the very accurate figure that the free wall of that ventricle is not sculptured into columnæ carnosæ, but merely presents an honeycombed appearance. It is in fact only unevenly pitted with variously sized excavations which acquire, near to the attached wall of the ventricle, some approach to the more usual arrangement of trabeculæ. The auriculo-ventricular valve itself was markedly tricuspid, and it is shown in the text-figure not in its normal position. For the cutting and reflection of the free wall of the ventricle has carried with it the muscles attached to the middle flap of the valve, the infundibular cusp of human anatomy. On the extreme left the valve is attached to the septal wall of the ventricle in a way which is not universal among Mammals. There is, in fact, a thick and well-marked papillary muscle in this situation which is shown in the figure, as are the other papillary muscles, as striated longitudinally, to distinguish them more definitely from the walls of the ventricle. This septal papillary muscle is quite short and very stout.

The anterior papillary muscle is rather complex. Its actual origin from the ventricular wall is marked by the letter "A" towards the right of the drawing (text-fig. 23), and a portion of it also arises from the neighbouring cut edge marked "B." The actual course of the papillary muscle and its subdivisions is shown on the left of the drawing with the same letters attached to the corresponding parts. It will be noticed that this, the anterior or great papillary muscle, arises very near to the junction between the free and the septal wall of the ventricle. The septal half of the auriculo-ventricular valve arises from or is connected with two perfectly distinct papillary muscles, of which the left-hand one (that to the right in the figure) is the larger. From the cut edge "A" to the left of the figure a muscle passing upwards is seen. This I regard as the moderator band. An interesting feature of this heart consists in the presence of chordæ tendineæ, which run parallel with the margin of the auriculo-

Text-fig. 23.



Interior of right ventricle of *Hippopotamus*.

AA, BB. Attachments of great papillary muscle.

ventricular valve and connect the successive papillary muscles. The arrangement of these is such as to suggest a former great extension of the membranous valve towards the apex of the ventricles.

It seems to me from the account given by Gratiolet * of this valve, that in the specimen which he dissected the papillary muscles of the septal half of the valve were not much developed. Otherwise there is no great difference between his account and that given above, save that I have entered into the matter somewhat more in detail.

Dr. Crisp, in his account of the Hippopotamus, remarks of the right auriculo-ventricular valve that the "tendons of the Tricuspid valve, seventeen in number, spring from three columns (so-called), one prominent and nipple-like, the others but little raised above the surface." I fancy from this account that the specimen examined by that anatomist was not unlike the one described by myself in the present communication. My figure shows a number of chordæ tendineæ which is not very far from the number asserted by Dr. Crisp, while his description of the musculi papillares, although not absolutely agreeing with the arrangement of those muscles as I saw it, emphasizes, as I think, the stout elevated muscle to the extreme right of the ventricular cavity in the figure.

The accompanying figure (text-fig. 24) represents the interior of the *right auricle* of the Hippopotamus, which has never been figured so far as I am aware, though many of the features there visible are referred to by previous writers. The auricular appendix, shown to the right of the drawing, is not completely opened up. A seeker is shown passing through the auriculo-ventricular orifice and appearing below, the ventricle being supposed to be completely removed. This will serve to orient the various parts of the auricle. Those parts of the auricle where the endocardium is very thin so as to expose the musculature, are represented as striated to emphasize this muscular appearance. On the right upper side of the drawing is seen the precaval vein (A.C.), which debouches very close to the orifice of the azygos (Az.). The arrangement is, in fact, exactly that of the Peccary (*Dicotyles torquatus*), of which animal I dissected a heart for the purposes of comparison with that of *Hippopotamus*. The circumference of the mouth of the azygos is 46 mm., while that of the precaval I calculate to be fully 60 mm. It is obvious, however, that the azygos is relatively very large. It has been already observed that the postcaval vein is very small where it debouches into the auricle. This is certainly the case in the heart which I examined and as is shown in the drawing (text-fig. 24, P.C.). I find on reference to the heart of the Peccary, that the conditions observable in the Hippopotamus are only an exaggeration of what is to be seen in the former animal. In the Peccary the postcaval is distinctly smaller than the precaval. In the Hippopotamus' heart the postcaval had unfortunately been cut away very close to the heart; but it must, I imagine, be limited to the area

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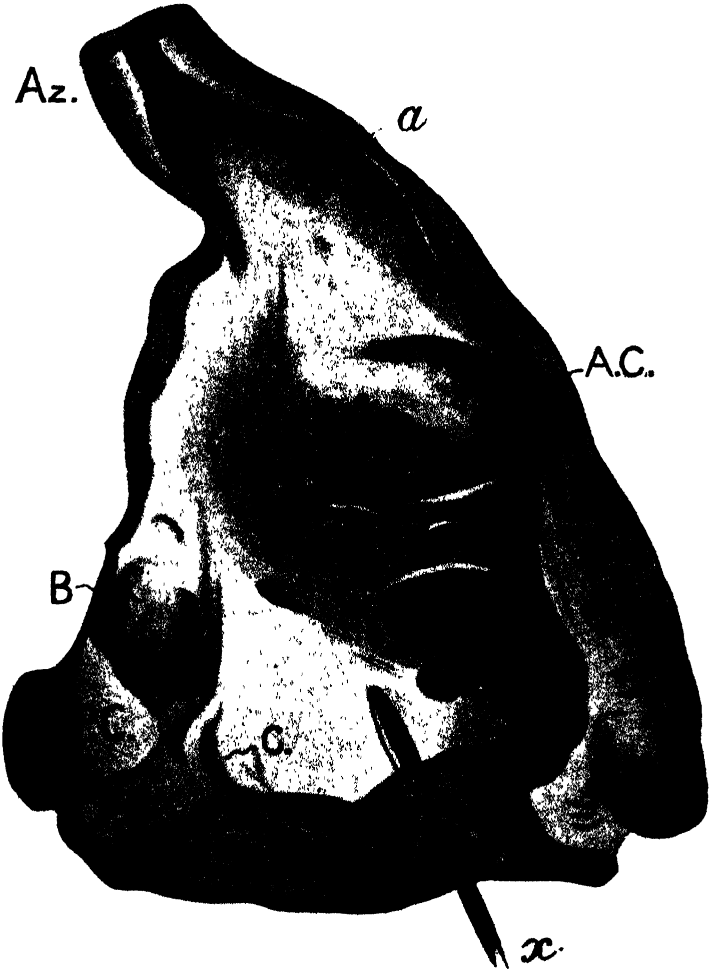
* *Loc. cit.* p. 358.

Text-fig. 24.



Interior of right auricle of *Hippopotamus*.

a. Orifice of tributary of azygos (Az.). A.C. Anterior vena cava. B. Deep recess. *b.v.* Orifice of small blood-vessel. C. Coronary vein. P.C. Postcaval vein. *x*. Probe passed through auriculo-ventricular orifice.

marked P.C. in text-fig. 24. This corresponds with the position of the same vein in the Peccary. If this be so, the vein is actually of less diameter than the azygos where both enter the heart. The letters *b.v.* in the text-figure indicate a depression in the wall of the auricle, which is here thick and muscular, as is also shown in the figure. Beyond this (*i. e.*, in the direction of the auriculo-ventricular valve) the wall becomes thin and white and very tough, suggesting the walls of a vein. This, however, can hardly belong really to the cut vena cava, the position of which would in that case become totally different to that of the Peccary. Beyond this point the walls of the auricle again become muscular, and a very sharp semicircular fold, as shown in the text-figure, marks the commencement of this muscular region. The fold is a little beyond (*i. e.*, towards the appendix auriculæ side) the entrance of the coronary vein. In the Peccary's heart the wall of the auricle is muscular for a much greater distance towards the orifice of the postcaval, and there is no membranous region, such as I have described above, opposite to the orifice of the coronary vein; indeed the muscular layer is seen to extend over about one-half of the flap which guards the orifice of the coronary vein. Nevertheless, beyond this point in the direction of the entrance of the postcaval the auricular wall is thin and membranous, *i. e.*, non-muscular. This fact gives me confidence in restricting the postcaval embouchure to the area lettered P.C. in the accompanying figure. It is therefore evidently a very small orifice relatively speaking. It may be seen also in the figure referred to (text-fig. 24, B) that the postcaval opens into an almost separate chamber of the auricle which is separated from the auricle itself by a high and broad ridge, beneath which, on the opposite side, lies the orifice of the coronary vein. Other than this there is no structure which can be termed an Eustachian valve. It will be seen in the figure that besides the pit in the auricular wall lettered *b.v.*, there are a few other and similar orifices scattered over the inside of the right auricle. These, which are not numerous, are to be regarded, I imagine, as the equivalents of the foramina Thebesii of human anatomists. I did not find the second precaval vein which Macalister has stated to be present in the dwarf Liberian Hippopotamus.

Through the kindness of Mr. R. H. Burne, I have been able to examine the heart of a Hippopotamus preserved in the Museum of the Royal College of Surgeons. The heart was a small one and obviously that of a fœtal or new-born animal, for the communication between the auricles was present, and the ductus Botalli was a wide vessel connecting the aorta and the pulmonary artery. I looked particularly at the relative sizes of the postcaval and precaval veins at their embouchure into the auricle; and although I am not able to give actual measurements, it was perfectly clear that both veins were roughly of the same size; in any case it is absolutely safe to say of this particular heart that the postcaval was not markedly smaller than the precaval. Gratiolet is very positive about the fact that in a young Hippopotamus which died about 24 hours after its birth, the postcaval opened into the heart by a narrow canal, while the precaval opened "par un sinus enorme."

Dr. Chapman found in two Hippopotami, about five and a half feet long, that the precaval was "very large and readily transmitting blood to the heart, whereas the inferior cava, at least that part above the diaphragm, is rather small."

Dr. Crisp's statements are a little uncertain in their interpretation. He wrote that the "superior cava . . . is short, thin, and very capacious, measuring 1¼ inch in diameter. The inferior cava is also very capacious." The latter phrase might, however, refer to the postcaval below the diaphragm; otherwise it is obviously in direct contradiction to Chapman. In any case the specimen at the College of Surgeons Museum can be examined, and it will, I think, be found that my statement concerning it is correct.

The *coronary arteries* are very large. It is important, however, to mention that (as my colleague, Dr. Plimmer, points out to me) this is associated with degenerative changes in the muscle of the heart and mucoid degeneration of the visceral layer of the pericardium. Still a large size of these arteries seems to be found in other aquatic Mammalia[*]. They are not dealt with by Gratiolet[†]. In the heart examined by myself the arteries were two, arising on opposite sides of the aorta. The two coronary arteries differ in their size and distribution. That which is concerned with the blood-supply of the right ventricle is much the larger. This coronary passes with a sinuous course along the anterior edge of the ventricle, between it and the auricle. At the end of the right ventricle the artery bends downwards and runs along the inter-ventricular border, but as two arteries, for it divides near to the point of alteration of direction. Before this the branches of the coronary are inconspicuous.

The lesser coronary artery supplies the walls of the left ventricle. It passes straight from the aorta to the commencement of the ventricle; here it bifurcates into two arteries, of which the shorter (that which is to the right when the heart is viewed from the side of the left ventricle) runs down towards the apex of the ventricle along the border line of the left and right ventricles. The other branch runs similarly along the base of the left ventricle to the other side of the left ventricle, when it suddenly changes its direction and runs towards the apex of the heart, but at a considerable distance from the neighbouring branch of the other coronary artery. It does not reach the apex, at least not as so important a branch. It is evident from their course and relative importance that these arteries in *Hippopotamus* hardly differ from the coronary arteries of man.

Among the arteries dealt with by Gratiolet we do not find any account of the *intercostals*. These I have represented in the accompanying figure (text-fig. 25), which does not, however, show the complete series. In order to abbreviate the figure conveniently, only a certain number of the anterior arteries are shown; but nothing is lost by this omission, since after the point at which the drawing ends the arteries have the same regular arrangement as in the latter part of that section of the aorta which is represented in the figure. The series commences with a pair of equisized apertures lying side by side. These are, I take

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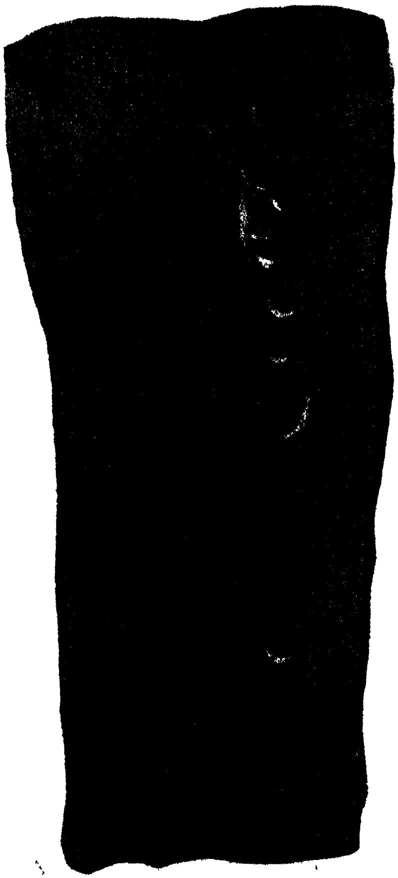
[*] *Cf.* Beddard, "Notes upon the Anatomy of a Manatee (*Manatus inunguis*)," P. Z. S. 1897, p. 52.

[†] *Loc. cit.* p. 361.

Text-fig. 25.



Commencing aorta of *Hippopotamus* cut open to show orifices of intercostal arteries.

A. Cluster of intercostal and bronchial arteries. B. Series of regular intercostals.

it, the mouths of origin of lung arteries. After a short gap there is a group of four arteries placed as is shown in the figure and crowded very close together. So close indeed, that the appearance of one artery with a cribriform plate at its aortic aperture is produced. Of the four, one or two are also lung arteries, as I ascertained by means of an inserted seeker. The others are intercostals. Then follow two arteries, one behind the other, which are placed rather more closely in sequence than those which follow. The latter form a series which are wider apart and perfectly regular until the end of the series, which, as already mentioned, is not shown in the drawing. It is to be noted, therefore, that the intercostals of this animal are quite unpaired at their origin from the aorta; the division occurs, however, shortly after the origin. The most important point of difference from the intercostal series of such other Mammals as I have had the opportunity of seeing, is in the mass of four arteries situated so close together at the beginning of the series, and which are lettered in the accompanying text-figure. The unpaired condition of the intercostals is perhaps rather less common among Mammals than a paired origin of these arteries. It is furthermore to be noted that there were no visible œsophageal arteries on the opposite side of the aorta in this region of that arterial trunk. Such arteries are commonly ventral instead of dorsal in position, and thus contrast with the intercostals and lung-arteries, which must be regarded as being one morphological series. It may be, however, that in the Hippopotamus the œsophageal arteries are derived from twigs of the intercostals; but as to this I have no positive information to offer.

The *azygos vein* is mentioned by Gratiolet only in the observation that "Les libres communications de l'azygos et des veines mammaires avec la veine cave supérieure indiquent que les muscles locomoteurs du tronc sont, ainsi que les centres nerveux, soustraits a toute case de congestion." In examining the thorax of the recently dead animal the apparent inconspicuousness of the azygos was striking. This was possibly due to the pleura of the thoracic wall being rather thick, but in other large animals such as the Zebra, where I have observed the azygos, it was perfectly obvious without further dissection, and I have figured it without difficulty in a number of Antelopes. So difficult to detect is this vein in *Hippopotamus*, that I had noted, before proceeding to dissection of the neighbouring parts, that the vein was absent as a distinct vein. I had in fact expected to meet with the conditions that appear to characterise the Cetacea, a state of affairs that would not perhaps have been unexpected. Nevertheless it does not occur, as I ascertained after the heart and lungs were removed, and therefore too late to give all the details desirable about this important vein in a type where it is likely to be interesting. I did, however, ascertain certain facts which are of importance in the systematic placing of this Ungulate. In the first place, there is a long azygos vein on the right side at any rate.

This is of itself important, because in the Artiodactyle Ungulates (with the exception only of the Tragulidæ—so far as we know at present) the main azygos is on the left side. There is, I believe, no other exception to this generalisation that has been described. In the second place, the azygos must lie very close to, in fact practically upon, the middle line of the centra of the dorsal vertebræ, for the cut ends of the intercostal trunks themselves lay very close indeed to this line, and I passed a probe up the intercostal vessel to its dorsal cut end, which was some way from the actual orifice into the azygos which, as already stated, had been removed. For some way along the ribs at any rate the intercostal veins were simple veins as in other Mammals, and there was no breaking up of the trunks into anything approaching the retia which Gratiolet has described in the case of the other veins.

In cutting away the aorta for further study the azygos was found to have been removed with it, and was firmly attached to the right side of the line along which the (at first sight) single intercostal arteries emerge from the aorta. It was, therefore, completely concealed when the various viscera were in position. It is obviously quite easy to determine upon which side of the aorta the azygos lay, since the intercostals must be supposed to emerge along the middle line, as they begin with single arteries which later divide into two branches, one for each side of the body. Judging in this way, the azygos of the Hippopotamus is a right azygos, and in this it agrees with *Tragulus* and differs from, at any rate, most of the Artiodactyles. It is very noteworthy that these two primitive genera should agree with each other and with the Perissodactyles and *Hyrax* *. It must, however, be recollected that *Cervus sika* has also a right azygos vein. I have already dealt with the opening of this vein into the right auricle †. The openings of its branches are very obvious, and have the same irregular arrangement anteriorly followed by a regular arrangement posteriorly, that we find in the case of the intercostal and other minor branches of the thoracic aorta. The first branch was a large one, about an inch from the auricular orifice of the vein. Behind this were two successive pairs of veins, of which one vein in each pair was rather larger than the other, and one vein of each pair was rather in advance of the other. Then followed a group of four inequisized venous orifices. At this point the azygos vein ceases from its close association with the aorta and passes straight to the right auricle, so that the veins hitherto considered belong (at any rate nearly all of them) to the visceral (œsophageal and pulmonary) affluents of the azygos. After this point come the regularly paired intercostals which lie on the ventral surface of the azygos just in front of the corresponding intercostal arteries.

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* Beddard, "On the Azygos Vein of Mammals," P. Z. S. 1907, p. 181.

† *Suprà*, p. 226.

6. The Entozoa of the Hippopotamus. By Robert T. Leiper, M.B., F.Z.S., Helminthologist to the London School of Tropical Medicine.

[Received February 1, 1910.]

(Text-figures 26–35.)

The parasites described in this paper were, with two exceptions, collected by me on the occasion of a visit to Uganda during the summer of 1907, as a member of the Egyptian Government Survey.

During a month's stay near the Murchison Falls on the Victoria Nile I dissected four Hippopotami for the purpose of ascertaining to what extent they harboured parasitic worms.

In every case worms were present in large numbers in the stomach, intestines, liver and subcutaneous tissues, comprising no less than *nine* species, of which *three* were round worms and *six* flat worms—no tapeworms occurred.

Shortly after my return to England I received from Dr. Sells, of the Uganda Medical Staff, a collection of parasites from various animals. Among these were two new species from the Hippopotamus that did not occur in my own series, but which for the sake of completeness are recorded here.

NEMATODA.

Family Trichostrongylidæ.

Genus Nematodirus.

1. Nematodirus hopkeni, sp. n. (Text-fig. 26, p. 234.)

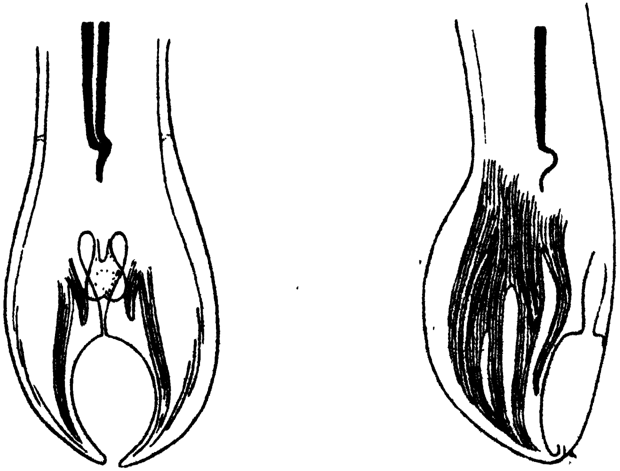
The habitat of this species is somewhat uncertain, as the few specimens representing it were found upon the peritoneal surface of the intestine and stomach after these had been opened. There seems little doubt that they had escaped from the stomach. The males are easily distinguished from the females by the presence of a bursa at their posterior ends and by their smaller size. The males measure 12 mm. and the females 18 mm. in length. The skin is transversely striated, and the striæ at the level of the junction of œsophagus with intestine are 0·003 mm. apart.

The mouth is unarmed, but is surrounded by three tiny lips.

The œsophagus is simple and gradually increases in diameter from its anterior to posterior end. At 0·3 mm. from the mouth it is crossed by the nerve ring, and at the same level the excretory pore opens on the ventral surface of the body. In the male, the bursa surrounding the posterior extremity consists of two long lateral flaps supported by six rays. The third or posterior membrane with its supporting posterior ray is entirely absent.

The spicules are equal in length and measure 0·43 mm. and are of a brown colour; they have a peculiar and characteristic shape—the proximal part is of uniform diameter, and then quite suddenly tapers to a sharp point; this attenuated portion resembling a note of interrogation. There are two small pre-bursal papillæ.

Text-fig. 26.



Nematodirus hopkeni.

Bursa of male, showing absence of posterior lobe.

Cervical papillæ are present in both sexes: they project as acicular points 0·4 mm. behind the nerve-ring. In the female the œsophagus measures 1·5 mm. in length. The anus is 0·25 mm. from the tip of the tail. The vulva lies 3·83 mm. in front of the anus. There is a short vagina of 0·1 mm., into which two uteri open; these uteri are provided with ovejectors. The ova are thin shelled and measure 0·065 by 0·035 mm. I name this species in honour of Baron Hermann v. Höpken, companion of our wanderings in Uganda.

Family FILARIDÆ.

Genus FILARIA.

2. FILARIA HIPPOPOTAMI, sp. n. (Text-fig. 27 A, p. 236.)

A couple of days after the dissection of one of the Hippos from which the previously described material was obtained, I happened to inspect some large pieces of the skin that my gun-bearer had saved, and was drying in the sun. My attention was attracted by the numerous white lines resembling pieces of cotton that interlaced the strands of connective tissue still adherent to the under surface of the skin. These on closer examination proved to be calcified filaria worms. A prolonged search resulted in the discovery of four living specimens, but unfortunately they were all females, and the description of the species must necessarily remain incomplete for the present.

The parasites measure 100 mm. in length and have a transverse diameter of 0·4 mm. The skin is quite smooth, the mouth is simple, and does not appear to be provided with definite papillæ. The œsophagus, like that of other filaria in mammals, is long and slender, measuring 2·6 mm. by 0·12 mm. At 0·5 mm. from the mouth it is crossed by the nerve-ring. The anus is situated 0·45 mm. from the tip of the tail. The vulva opens 1·55 mm. from the anterior end. The vagina is a muscular-walled tube passing directly backwards therefrom to divide at the level of the junction of the œsophagus with the chyle intestine into two long uterine tubes. These tubes are at first narrow (0·05 mm.) and pass backwards for a considerable distance side by side; they become distended later with embryos, and together with the ovarian tubules occupy the perivisceral cavity from 0·8 mm. behind the vulva to the anus.

The posterior end of the worm is bluntly rounded, and in the middle line terminates in a small cuticular knob with a slightly depressed tip. On either side of this cuticular termination the integument is distinctly raised by a pair of large fleshy papillæ.

This species is apparently closely related to *Filaria demarquai* of man.

3. Cobboldia vivipara, gen. et sp. n. (Text-fig. 27 B, C.)

The mucous secretion upon the lining of the stomach of the Hippopotamus was infested with myriads of a minute form of Nematode that is, when alive, almost invisible to the naked eye on account of its transparency. The males and females resemble each other very closely, and can only be distinguished by a microscopical examination. The former measure 4·0 mm., the females 4·3 mm. in length. The skin has no transverse striæ, but longitudinal lines are visible through the cuticle. In the male the body maintains an almost uniform diameter of 0·09 mm. from the excretory pore to the genital opening. The body tapers anteriorly from the excretory pore to 0·03 mm. at the head, and likewise posteriorly from the anus to end at the tail in an acicular point. In the female a uniform diameter of 0·1 mm. is only maintained in the second quarter of the body length, whence it tapers gradually to 0·04 mm. at the head, and uniformly through the whole of the posterior half of the body to a sharp-pointed tail similar to that in the male.

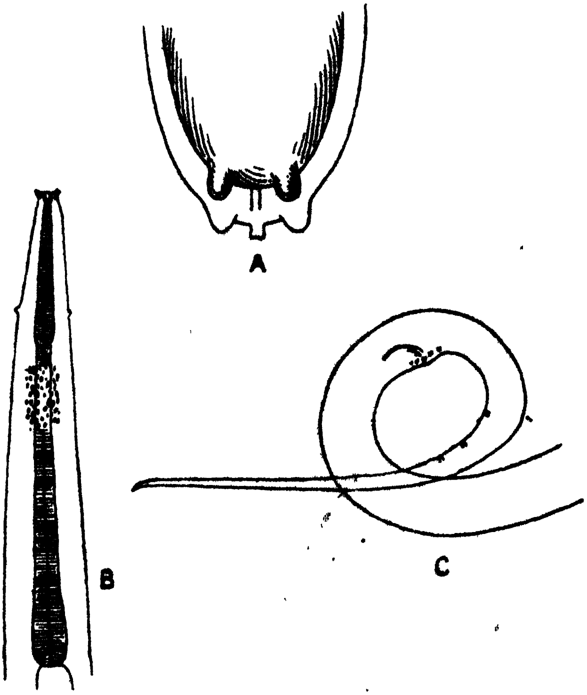
The mouth is surrounded by a collar of cuticle which has a median triangular prolongation on its dorsal and ventral aspects. The whole collar is supported by four finger-like papillæ, the lateral pair supporting the apices of the triangular flaps being twice the length of the median pair which maintain the basal angles.

The œsophagus is long and slender and becomes bulbous in its posterior fourth; it unites with the chyle intestine at 0·65 mm. from the mouth in both sexes.

The nerve-ring is very broad (0·01 mm.) and surrounds the œsophagus in its middle third at 0·25 mm. from the head.

The excretory pore opens 0·5 mm. from the anterior end of the body.

Text-fig. 27.



A. *Filaria hippopotami.* Tail of female.
B (head) and C (tail of male) of *Cobboldia vivipara.*

In the male the testicular tube pursues an almost straight course alongside of the intestine from the cloaca to within 0·5 mm. of the œsophagus, then sharply doubles upon itself for 0·24 mm. and ends in a blunted tip.

The two spicules are short undulating chitinous rods with fine transverse markings; they measure 0·26 mm. and 0·055 mm. in length.

The genital papillæ are sessile and consist of a circumanal group of five pairs, and in addition there are four pairs of post-anals distributed along the tail at gradually diminishing distances from each other.

In the female the anus opens 0·95 mm. from the posterior extremity. The vulva is 0·07 mm. in front of the anus. The anatomy of the female organs cannot be accurately determined as these structures are greatly distended by two or three embryos of enormous size, the containing cyst measuring 0·3 mm. by 0·1 mm. This retention of the ovum within the maternal body until it has completed its larval development and has attained adult form, is found also in *Probstmayria vivipara* which occurs in horses in various parts of the world.

I have named this genus in honour of the late Dr. Cobbold.

CESTODA.

No tapeworms were present in any of the animals examined. Cobbold mentions that "Livingstone has drawn attention to the fact that the river-horse is much infested by tapeworms," but I cannot find a description of such parasites anywhere in literature.

TREMATODA.

Family FASCIOLIDÆ.

Genus FASCIOLA.

4. FASCIOLA NYANZÆ, sp. n. (Text-fig. 28, p. 238.)

This species was found exclusively in the bile-ducts of the liver, and in most instances the specimens were somewhat macerated owing to the length of time that necessarily elapsed before the animal could be recovered from the water.

The genus *Fasciola*, in the restricted sense in which it was used first by Cobbold, comprises only the species *F. hepatica*, *F. gigantica*, *F. magna*, from Ruminants, and *F. jacksoni* from Elephants. These four species differ mainly in the shape and size of the body, the character of the internal branches of the gut and the distribution of the yolk-glands, especially with reference to their encroachment upon that region of the body which lies between the main gut branches. *F. nyanzæ* is more closely related to *F. hepatica* and *F. gigantica* than to the other forms, differing mainly in the feeble development of spines on the integument, and the restriction of the branched testes to the anterior third of the body.

Form, etc.—The parasite measures 69 mm. in length; greatest breadth 9·3 mm., *i. e.* in the proportion of 7 to 1, whereas in *F. hepatica* the proportion is only 2 to 1, and in *F. gigantica* 4 to 1.

The cephalic cone is well defined and when contracted measures 3 mm. in length.

The body expands almost immediately behind the cone to attain its greatest diameter, whence it tapers very uniformly to the posterior end of the body, having midway a diameter of only 6 mm., and 3 mm. at less than 2 mm. from the posterior end.

The oral sucker measures 0·9 mm. broad by 0·7 mm. long. The musculature is 0·3 mm. thick. The ventral sucker lies at the base of the cephalic cone, is spheroidal and has an antero-posterior diameter of 1·25 mm., and its muscular wall is 0·4 mm. in thickness.

The alimentary canal has a well-developed pharynx and an exceedingly short œsophagus. The two guts give off numerous external ramifying branches. The internal branches on the other hand are relatively few, and resemble those of *F. hepatica.* They rarely branch.

Text-fig. 28.

Fasciola nyanzæ. Nat. size.

a. Gut branches uncovered by yolk-glands.
b. Upper limit of yolk-glands.
c. Area occupied by testes.
d. Area occupied by yolk-glands.

The yolk-glands are very extensive and occupy the whole of the posterior 44 mm. of the body; they extend forwards also on either side of the testes to the level of the shell-glands, leaving the "shoulders" of the parasite free for over 2 mm.

The greatly ramified testes lie in the anterior third only of the body, and in comparison with the other forms occupy a relatively small area.

The specimens were not sufficiently well preserved to allow of the differentiation, by staining, of the branched ovary from the testes. The uterine coils lie immediately behind the ventral sucker, and are few in number. They contain numerous large dark brown eggs ovoid in shape and measuring 0·15 mm. by 0·07 mm.

Family PARAMPHISTOMIDÆ.

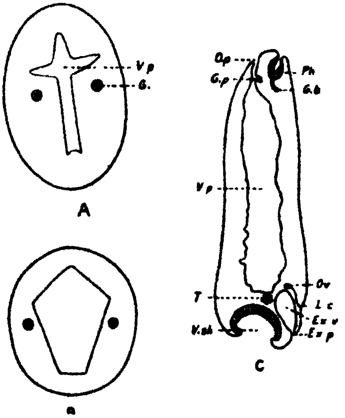
Genus GASTROTHYLAX.

5. GASTROTHYLAX CRUCIFORMIS, sp. n. (Text-fig. 29 A, B, C.)

This species occurred in considerable numbers associated with *Paramphistomum buxifrons* in the stomach. When alive the specimens are of a deep red colour which changes to brown after preservation in formalin. They have the characteristic form of

Gastrothylax. The body measures 0·5 mm. to 0·8 mm. in length, and is cylindrical in shape, tapering to a blunt point anteriorly, the posterior end being truncate and occupied by the terminally situated ventral sucker 0·9 mm. in dorso-ventral diameter, with a muscular wall 1·8 mm. thick. All the specimens obtained were sexually immature, but the peculiar configuration of the ventral pouch is alone sufficient to distinguish this from all previously described forms. The entrance to the cavity of this pouch is a transverse slit on the ventral surface, 0·35 mm. from the oral opening. When seen in sagittal section the cavity has an almost uniform breadth of 0·5 mm. from a short way behind the genital pore to its blind end upon the dome of the ventral sucker. In transverse section the cavity maintains a distinctly pentagonal shape in all degrees of contraction of the body; the base of the pentagon lying parallel to and upon the ventral surface, and the apex projecting towards the dorsal surface of the parasite. In certain conditions of contraction the two sides that form the apical angle and the side that forms the base frequently buckle so as to produce the figure of a cross; under no circumstances are the five angles obliterated.

Text-fig. 29 *.



Gastrothylax cruciformis.

A, B. Transverse sections. C. Median longitudinal section.

The cuticle is thin and smooth, with tiny knob-like papillæ near the mouth.

The pharynx is small, globular, and measures 0·32 mm. in length and 0·26 in breadth, the muscular wall being 0·09 mm. in thickness.

The œsophagus measures 0·2 mm. in length and 0·08 mm. in breadth.

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* For explanation of abbreviations used in the text-figures see p. 251.

The gut-branches have a width of 0·06 mm. and follow a wave-like course to end at the level of and ventral to the testes.

The genital opening lies immediately behind the pharynx and discharges into the narrow channel leading into the ventral pouch. It lies in front of the bifurcation of the gut.

The genital atrium is 0·1 mm. deep and 0·1 mm. wide.

The testes are small rosette-like bodies lying one on either side of the middle line in the pad of parenchymatous tissue that intervenes between the blind end of the ventral pouch and the dome of the ventral sucker. They measure in my immature specimens 0·2 mm. in diameter. The various parts of the genital tube cannot be satisfactorily delimited as the worm had not reached sexual maturity.

The yolk-glands are undeveloped in the specimens.

The ovary rests upon the fundus of the excretory vesicle on the connective tissue between the ventral pouch and the dorsum.

The shell-glands are undeveloped; their rudiment lies just ventral to the ovary.

The uterus contains no eggs.

Laurer's canal crosses over the fundus of the excretory vesicle to open opposite its centre.

Excretory vesicle is a large egg-shaped cavity 0·6 mm. in length by 0·3 mm. in breadth, lying with its longitudinal axis parallel to that of the body. Its posterior more pointed half rests upon the dorsal surface of the ventral sucker. The excretory duct is very short (0·07 mm.) and passes diagonally from the excretory vesicle to the dorsal surface. The excretory pore lies at a distance of 0·36 mm. behind Laurer's canal, which curves over the fundus of the vesicle.

Genus PARAMPHISTOMUM.

6. PARAMPHISTOMUM GIGANTOCOTYLE Brandes. (Text-fig. 30.)

Otto and Buchner have previously found this species in small numbers, but only the former has given any account of the parasite. Otto's description is very incomplete, and on some points is apparently incorrect. No mention is made of the pharyngeal pouches, or of the openings of Laurer's canal and excretory vesicle. He states that there is only one testis. I attribute my specimens to this species mainly on the ground of the presence of an exceedingly large ventral sucker.

Form, etc.—The body is pyriform, the anterior being the pointed end. It measures 8 mm. in length and 2·75 mm. in greatest diameter. The dorsal surface is markedly convex, and the large ventral sucker presents entirely on the ventral aspect of the body. This sucker has an antero-posterior internal diameter of no less than 3·2 mm., and its wall is 0·4 mm. in thickness. The opening of the sucker varies considerably in size in different specimens: in well-preserved ones its usual diameter is about 1·6 mm., in macerated worms it may exceed even 4 mm.

The cuticle is smooth and there are no papillæ surrounding the mouth.

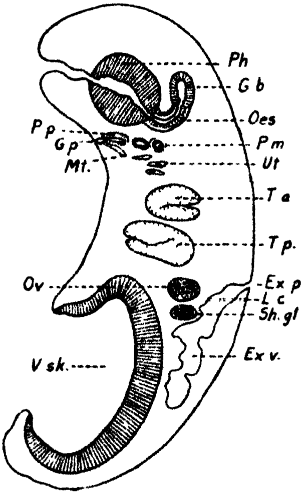
The pharynx is oval, and measures 1·1 mm. in length by 1 mm. in transverse diameter, and its musculature has a thickness of 0·4 mm. There are no pharyngeal pouches.

The œsophagus is **S**-shaped, measures 0·9 mm. in length by 0·2 mm. in breadth. The musculature of its wall is only slightly developed.

The bifurcation of the gut lies anterior to the genital pore on a level with the posterior fourth of the pharynx.

The gut-branches have a width of 1 mm. and end blindly upon the sides of the ventral sucker at the level of its lower lip.

Text-fig. 30.



Paramphistomum gigantocotyle. Median longitudinal section.

The genital opening lies on the ventral surface midway between the mouth and the anterior limit of the ventral sucker. The genital atrium is slit-like. Its wall is strengthened by some thickening of the subcuticle.

The testes, two in number, are deeply incised transversely so as to give to each the appearance, in some sections, of two distinct bodies. Otto makes the statement that there is only one testicular mass. The testes are almond-shaped: they lie in contact, one behind the other, with their longitudinal axis, 1·1 mm., at right angles to that of the body. The maximum antero-posterior measurement is 0·5 mm.

The yolk-glands consist of numerous very small follicles scattered throughout the parenchymatous tissue on the outer aspects of the voluminous gut-branches.

The ovary occupies the centre of the triangular area limited by the testis anteriorly, the anterior half of the excretory vesicle dorsally, and the dome of the ventral sucker ventrally; it has a diameter of 0·5 mm.

The shell-glands lie in the posterior angle of the same area just below the ovary.

Laurer's canal crosses the excretory vesicle near its duct, and opens upon the dorsum lateral to and behind the excretory pore.

The excretory vesicle is an elongated fissure-like cavity 2·2 mm. long and 0·3 mm. wide. It discharges by a duct only 0·15 mm. in length on the dorsal surface, at a point in line with the anterior borders of the ventral sucker and the ovary.

A few specimens of this species occur in Dr. Sells' collection.

7. PARAMPHISTOMUM BUXIFRONS, sp. n. (Text-fig. 31.)

Enormous numbers of this species were found in the stomach, attached to the mucous membrane. They are readily distinguishable by their brownish pigmentation and leaf-like shape. For the present the species is placed in the genus *Paramphistomum*, but it departs very considerably from the type as defined by *P. cervi* in shape of the body, the position of the ventral sucker, and the relation to each other of the two testes.

Form, etc.—The body is very similar in shape to the leaf of the box tree, and on this account *buxifrons* has been selected as the specific name of the parasite. The measurements vary very considerably with the amount of contraction of the individual specimens. A large example may measure 5 mm. by 3 mm. in breadth, and be only 0·4 mm. in thickness at the middle of the body. Contracted specimens have a transversely corrugated ventral surface and a distinctly convex but smooth dorsal surface. The posterior end is always truncated, and the ventral sucker opens quite terminally. This sucker has a dorso-ventral diameter of 0·7 mm., its wall is 0·3 mm. at its thickest part, and its aperture is 0·15 mm. wide. The cuticle is smooth, but there are digitate papillæ surrounding the mouth, and the subcuticle on the ventrum is pigmented and markedly thickened (0·01 mm.), and the cuticle covering it thrown into irregular transverse folds.

The pharynx is pyriform, 0·45 mm. long by 0·24 mm. broad, and the musculature is 0·08 mm. at its thickest part. There are no pharyngeal pouches.

The œsophagus has a length of 0·24 mm. and is 0·035 mm. in breadth. Its wall is fairly strongly developed and measures 0·04 mm. in thickness. The whole œsophagus lies anterior to the level of the genital pore.

The gut-branches are about 0·06 mm. wide; they pursue a serpentine course and terminate about 0·1 mm. in front of the ventral sucker.

Genitalia.—The genital opening lies at the junction of the anterior quarter with the rest of the body, 0·5 mm. behind the bifurcation of the gut. The genital atrium is small; its wall is formed by a thickening of the subcuticle.

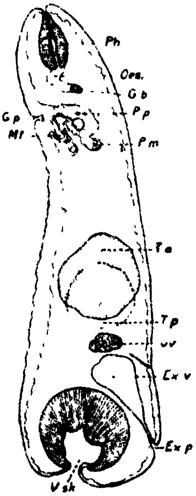
The testes, two in number, are large, smooth, spheroidal bodies occupying the anterior third of the posterior half of the body, and are situated diagonally one slightly behind the other. They measure 0·55 mm. antero-posteriorly, and 0·5 mm. dorso-ventrally, occupying practically the whole space between the dorsal and ventral integuments.

The vesicula seminalis is small and characterised by very few coils.

The pars musculosa is short, well defined, and provided with a thick muscular coat.

The pars prostatica has a greatly thickened wall composed mainly of secretory cells.

Text-fig. 31.



Paramphistomum buxifrons. Median longitudinal section.

The ductus ejaculatorius measures 0·04 mm. in length, uniting with the metraterm to form the ductus hermaphroditicus and so discharges into the slit-like atrium.

The yolk-glands are poorly developed and lie wholly outside the gut-branches; the follicles are small and measure 0·1 mm. by 0·05 mm. in diameter.

The ovary lies between the testes and the excretory vesicle; it measures 0·25 mm. by 0·13 mm.

The shell-glands lie lateral to and in contact with the ovary.

The uterus has few coils.

Laurer's canal passes outwards from the ovary to the dorsal surface of the body, passing over the fundus of the excretory vesicle and opening 0·53 mm. in front of the excretory pore.

The excretory vesicle is pear-shaped, measures 0·7 mm. in length by 0·3 mm. in greatest breadth at the fundus, tapering gradually as it passes backwards to terminate in the excretory duct, 0·1 mm. in length, that opens on the dorsal surface in the middle line and at the level of the centre of the ventral sucker.

The median longitudinal serial section of the parasite from which the above measurements were all derived measured 3·5 mm. in length, 1 mm. at the level of the dome of the ventral sucker, 0·65 mm. at the level of the genital pore dorso-ventrally.

8. PARAMPHISTOMUM MINUTUM, sp. n. (Text-fig. 32.)

Among the specimens of *P. buxifrons* collected from the stomach were seen a number of very minute forms distinguished by the absence of pigment. These were at first regarded as young forms of *P. buxifrons*, but on cutting serial sections of two or three of them I was surprised to find that they were sexually mature, and that in each the uterus contained eggs. In other respects, especially in the structure of the genital atrium, they differed markedly not only from *P. buxifrons* but also from the other amphistomes.

Form, etc.—The body is oviform in shape and measures 2·7 mm. in length by 0·7 mm. in thickness. The ventral sucker lies subterminally and measures 0·66 mm. in diameter; its musculature is 0·28 mm. thick at the dome, its cavity is 0·46 mm. wide, and its aperture is 0·32 mm. The cuticle is smooth and of uniform thickness on the dorsal and ventral surfaces. There are a few papillæ around the mouth.

The pharynx is globular in shape, measuring 0·45 mm. long by 0·3 mm. broad, with a musculature of 0·14 mm. at its thickest part. There are no pharyngeal pouches.

The œsophagus is 0·18 mm. in length and has a diameter of 0·08 mm. The bifurcation of the gut lies behind the genital atrium, which opens at the level of the junction of the œsophagus and pharynx. The two gut-branches have a width of about 0·1 mm., and end after a tortuous course just anterior to the ovary.

The genital pore opens at the junction of the anterior fifth with the rest of the body, immediately behind the pharynx.

The genital atrium has a well-developed muscular wall 0·1 mm. in thickness and sharply delimited from the surrounding parenchyma.

The testes are relatively very small in size, oval in shape, and measuring only 0·2 mm. antero-posteriorly by 0·15 mm. dorsoventrally; they lie one in front of the other in the middle line of the body, but nearer the ventral than the dorsal surface, and their longitudinal axis is placed at an angle of 30° ventral to the median line of the body. If the body length be divided into two equal parts, the anterior border of the front testis marks the commencement of the second portion. The testes are separated from each other by a space equivalent to their antero-posterior diameter.

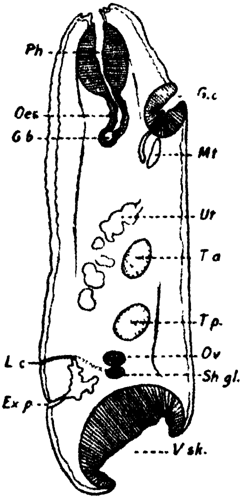
The vesicula seminalis is represented by a small rosette-like coil of the genital tube midway between the anterior testis and the bifurcation of the gut. It merges into the pars musculosa, a short feebly developed portion about 0·15 mm. long.

The pars prostatica, 0·15 mm. in length, is straight and has a fissure-like cavity. It discharges by the penile ductus ejaculatorius that protrudes into the metraterm.

The ductus hermaphroditicus, 0·1 mm. in length, projects like the tip of a finger into the atrium for a distance of 0·03 mm.

The yolk-glands form two vertical rows around the gut-branches, and range from the bifurcation of the gut to the level of the ovary.

Text-fig. 32.



Paramphistomum minutum. Median longitudinal section.

The ovary is spheroidal and is placed dorsad of and slightly posterior to the testis.

The shell-glands lie immediately behind the ovary, resting upon the anterior wall of the excretory vesicle.

The uterus is filled with eggs and passes into the metraterm 0·3 mm. behind the atrium.

Laurer's canal passes outwards from the level of the shell-glands to open some little distance in front of the excretory pore; it does not cross any portion of the excretory vesicle or duct.

The excretory vesicle is small and, as seen in vertical section, has an exceedingly irregular outline. It lies almost wholly in front of, and somewhat dorsal to the ventral sucker. It discharges at its posterior limit by a short, straight, thick-walled duct that runs out to the dorsal surface parallel to, and 0·25 mm. behind Laurer's canal.

9. PARAMPHISTOMUM SELLSI, sp. n. (Text-fig. 33.)

The specimens contained in one of the tubes sent to me by Dr. Sells showed such marked variations in shape that at first I separated them into three well-defined groups, thinking that these would prove on further study to represent distinct though closely allied species. A comparison of serial sections of these forms has convinced me, however, that they represent merely different degrees of contractility in one and the same species. One stage showed distinct dorso-ventral flattening approaching in appearance the outline of a Polyclad Turbellarian. The second stage resembled in outline an ordinary Amphistome with the ventral sucker presenting wholly on the under surface. In the third stage the worm assumed an elongated form not unlike an ear of wheat: the posterior sucker having become completely everted and presenting terminally.

The parasite measures from 4 mm. to 6 mm. in length, and varies considerably in breadth. The ventral sucker opens on the under surface at the posterior end of the body, except in greatly elongated examples as already mentioned. Its greatest diameter is 0·53 mm., its cavity is 0·4 mm. in width, and the musculature has an almost uniform thickness of 0·13 mm.

The cuticle is but feebly developed all over the body, having a thickness of less than 0·01 mm. Surrounding the anterior end of the body are numerous fungoid papillæ arranged in parallel rows.

The pharynx is flask-like in shape, and is much less strongly developed than in the other Amphistomes. It measures in length 0·35 mm., in breadth 0·27 mm., and its musculature has a depth of only 0·1 mm. at its thickest part. There are no pharyngeal pouches.

The œsophagus is 0·5 mm. in length, 0·07 mm. in breadth, with a very thin muscular sheath.

The gut-branches are 0·2 mm. broad in front of the ventral sucker, and end about the level of the fundus of the excretory vesicle.

The genital opening lies at the junction of the anterior third with the rest of the body, and is situated at about 0·5 mm. behind the bifurcation of the gut. There is a large genital atrium exceeding in size the oral sucker and having an aperture of 0·3 mm. and a depth of 0·3 mm.; its muscular wall is 0·15 mm. thick, and is sharply marked off from the parenchym.

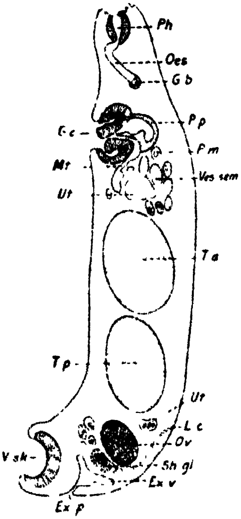
The testes lie in contact, one in front of the other, in the posterior half of the body, are oval in shape, and are not lobed; they have a diameter antero-posteriorly of 1·0 mm. and dorso-ventrally of 0·7 mm.

The vesicula seminalis is a wide tube filling with its coils almost the whole space between the atrium and the anterior testes.

The pars musculosa is, on the other hand, almost absent, and is represented only by a narrow duct discharging by a tiny pore into the pars prostatica, a sausage-like dilated cavity.

The ductus ejaculatorius is funnel-like, its thick muscular walls are really a portion of the atrial musculature. It is 0·14 mm. in length and unites with the metraterm to form the ductus hermaphroditicus, which discharges upon the summit of an enormous muscular pad.

Text-fig. 33.



Paramphistomum sellsi. Median longitudinal section.

The yolk glands extend from behind the pharynx to the sides of the ventral sucker; they are arranged in single file and the follicles are clumped into masses of enormous size, measuring each about 0·2 mm. in diameter.

The ovary is large and oval, placed with its greatest diameter (0·5 mm.) dorso-ventrally between the posterior testis and the fundus of the excretory vesicle.

The shell-glands lie immediately behind the ovary and occupy almost wholly the space intervening between it and the excretory vesicle.

The uterus passes dorsally over the testes following a fairly straight course, and discharges into the metraterm 0·75 mm. from its union with the ductus ejaculatorius.

Laurer's canal runs from the shell-glands in an anterior direction, passing the ovary dorsally to open in the middle line at the level of the posterior edge of the second testis; it does not cross the excretory vesicle in any part of its course.

The excretory vesicle as seen in longitudinal section is Y-shaped, embracing the shell-glands within its two arms; its cavity merges almost insensibly into the short excretory duct which passes backwards to open at the level of the dome of the ventral sucker 1·2 mm. behind Laurer's canal.

The above measurements are all taken from serial sections of a single specimen 6 mm. in median longitudinal section.

10. PARAMPHISTOMUM PISUM, sp. n. (Text-fig. 34.)

This form, unlike those hitherto described, lives in the small intestine. It is white in colour with the faintest tinge of pink. In shape it is pisiform, but the specimens preserved all exhibit a certain amount of contraction. The ventral sucker lies subterminally, and its aperture as seen with the naked eye is a minute pore no larger than that of the mouth (0·3 mm.). Its greatest diameter is 1·7 mm.; the muscular wall is 0·4 mm. thick, the cavity 1·0 mm. wide.

The dorsal cuticle is 0·02 mm. thick and is differentiated into two parts, the external layer being 0·01 mm. thick, and there do not appear to be any papillæ at the anterior end of the body. The cuticle on the ventral surface is very thin.

The pharynx lies some distance (0·9 mm.) from the oral pore, is globular in shape, 1·2 mm. long, 1·1 mm. broad, and its muscular wall is 0·4 mm. thick. There are no pharyngeal pouches.

The œsophagus is short, exceedingly wide, and in contracted specimens shows several transverse folds. Its wall has thick strands of muscle. It measures 0·3 mm. in length by 0·6 mm. in breadth.

The gut-branches are also very wide, measuring 0·6 mm.

The genital pore lies only 0·9 mm. behind the oral opening (and in contracted specimens) at the level of the centre of the pharynx.

The genital atrium is small and fissure-like, and its wall is composed of an inward extension of the sub-cuticle, which is sharply marked off from the parenchym. A few muscular fibres are seen in its wall.

The testes are large and deeply lobed: they lie in the ventral half of the body, and occupy almost the whole of that region between the pharynx and the ventral sucker. It is impossible from serial sections to ascertain exactly their individual size; they appear to lie one in front of the other.

The vesicula seminalis is a thin-walled voluminous tube crowded with sperm-cells. It completely fills the ventral half of the area intervening between the bifurcation of the gut and the anterior testis.

The pars musculosa is spirally coiled and there is a fair amount of contractile tissue in its wall.

The pars prostatica is pyriform, but, for the size of the animal, is relatively small.

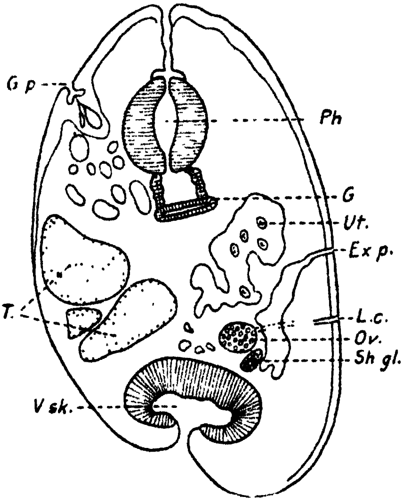
The ejaculatory duct is only 0·01 mm. long.

The ductus hermaphroditicus is about the same length and opens upon a stunted crateriform thickening of the atrial wall.

The yolk-glands extend from the level of the base of the oral opening to that of the dome of the ventral sucker. They also stretch inwards dorsally over the gut towards the middle line. The follicles are large, irregularly arranged masses, 0·5 × 0·3 mm.

The ovary is an oval body 0·8 mm. in dorso-ventral and 0·45 mm. in antero-posterior diameter, lying almost in contact with the dome of the ventral sucker.

Text-fig. 34.



Paramphistomum pisum. Median longitudinal section.

The shell-gland mass is situated lateral to, and a little behind, the ovary. It lies in contact with the dome of the ventral sucker and the under surface of the posterior half of the excretory vesicle.

The uterus is a widely dilated tube almost 1 mm. in diameter, filled with eggs measuring 0·15 × 0·07 mm.

Laurer's canal follows an almost straight course from the shell-glands to the dorsal surface, crossing the excretory vesicle at about its middle and opening about 1·4 mm. behind the excretory pore.

The excretory vesicle discharges by an excretory pore situated about 1·4 mm. in front of Laurer's canal, and from this opening its fissure-like cavity (0·15 mm. wide) stretches backwards towards the dome of the ventral sucker for a distance of 1·5 mm.

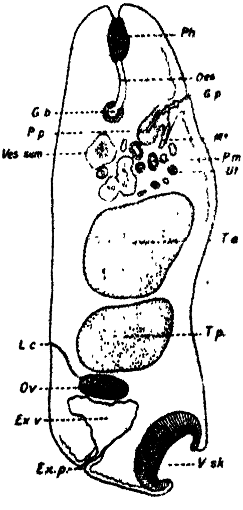
11. Paramphistomum cotylophorum Fischoeder.

A phial sent by Dr. Sells and labelled "from the Hippopotamus" contained a number of specimens of this species. As *P. cotylophorum* is by far the commonest parasite of cattle, buffaloes and antelopes in Uganda, it is by no means impossible that infection of the Hippopotamus may occur. On the other hand, there may have been a mistake in the labelling, for another phial of similar forms "from a Buffalo" was received at the same time.

12. Paramphistomum wagandi, sp. n. (Text-fig. 35.)

A few specimens of this species occur in Dr. Sells' collection. They are small and whitish and fairly closely resembling grains of boiled rice. The specimens have a length, in section, of 3·5 mm. and a dorso-ventral diameter of 1·2 mm., and are very like *P. sellsi* in outward appearance. The genital pore is, however, very minute, and a genital sucker is absent.

Text-fig. 35.



Paramphistomum wagandi. Median longitudinal section.

The pharynx is poorly developed when compared with other forms. It is elongated in shape, measuring 0·3 mm. in length, 0·14 mm. in greatest diameter, and has a musculature of 0·07 mm.

The œsophagus measures 0·33 mm. in length and bifurcates at the level of the genital pore.

The ventral sucker lies subterminally and has a transverse measurement of 0·5 mm. The musculature of its dome is 0·2 mm. thick. The dorso-ventral diameter of its cavity is 0·37 mm.

The excretory vesicle lies dorsal to and slightly in front of the ventral sucker. It is pyriform in shape and discharges posteriorly by a short thick-walled canal 0·16 mm. long in the mid-dorsal line, 0·6 mm. in front of the lip of the ventral sucker, and 0·9 mm. behind Laurer's canal.

The genitalia discharge by a small common pore at the level of the bifurcation of the gut. The arrangements of the various structures in this region are well shown in text-fig. 35.

The testes are two large round or ovoid bodies 0·45 mm. by 0·6 mm. in diameter, lying one in front of the other, the posterior resting upon the ovary and shell-gland.

The ovary is elongated dorso-ventrally, being wedged in between the posterior testis and the fundus of the excretory vesicle. It measures about 0·25 mm. by 0·09 mm.

The shell-glands form a well-defined mass lying slightly to one side of the ovary. From them Laurer's canal can be traced forwards and to the dorsal surface to discharge there at about the level of the centre of the posterior testis and in the middle line 0·9 mm. in front of the excretory pore.

EXPLANATION OF ABBREVIATIONS USED IN THE TEXT-FIGURES.

Ex.p	Excretory pore.	*Ph.*	Pharynx.
Ex.v.	Excretory vesicle.	*P.m.*	Pars musculosa.
G.	Gut, main branch.	*P.p.*	Pars prostatica.
G.b.	Gut bifurcation.	*Sh.gl.*	Shell-gland.
G.c.	Genital cup.	*T.*	Testis.
G.p.	Genital pore.	*T.a.*	Anterior testis.
L.c.	Laurer's canal.	*T.p.*	Posterior testis.
Mt.	Metraterm.	*Ut.*	Uterus.
Oes.	Œsophagus.	*V.p.*	Ventral pouch.
O.p.	Orifice of ventral pouch.	*V.sk.*	Ventral sucker.
Ov.	Ovary.	*Ves.sem.*	Vesicula seminalis.

February 15, 1910.

Dr. S. F. HARMER, M.A., F.R.S., Vice-President,
in the Chair.

The Secretary read the following report on the additions made to the Society's Menagerie during the month of January 1910:—

The number of registered additions to the Society's Menagerie during the month of January last was 117. Of these 72 were acquired by presentation, 7 by purchase, 2 were received on deposit, 31 in exchange, and 5 were born in the Gardens.

The number of departures during the same period, by deaths and by removals, was 199.

Amongst the additions special attention may be directed to:—

One English Wild Bull (*Bos taurus* var.), born in the Menagerie on Jan. 14th.

One Eland (*Taurotragus oryx*) ♀, born in the Menagerie on Jan. 20th.

One Congo Marsh-Buck (*Limnotragus gratus*), born in the Menagerie on Jan. 14th.

One Sambur Deer (*Cervus aristotelis*), born in the Menagerie on Jan. 25th.

Four Persian Gazelles (*Gazella subgutturosa*) 1 ♂, 3 ♀, from Meshed, presented by Capt. J. W. Watson, I.M.S., and Major R. L. Kennion, I.S.C., F.Z.S., on Jan. 8th.

One Wood-Brocket (*Mazama nemorivaga*), from Brazil, presented by Frederick Burgoyne, Esq., F.Z.S., on Jan. 31st.

One Mallee Bird (*Leipoa ocellata*), from Australia, deposited on Jan. 24th.

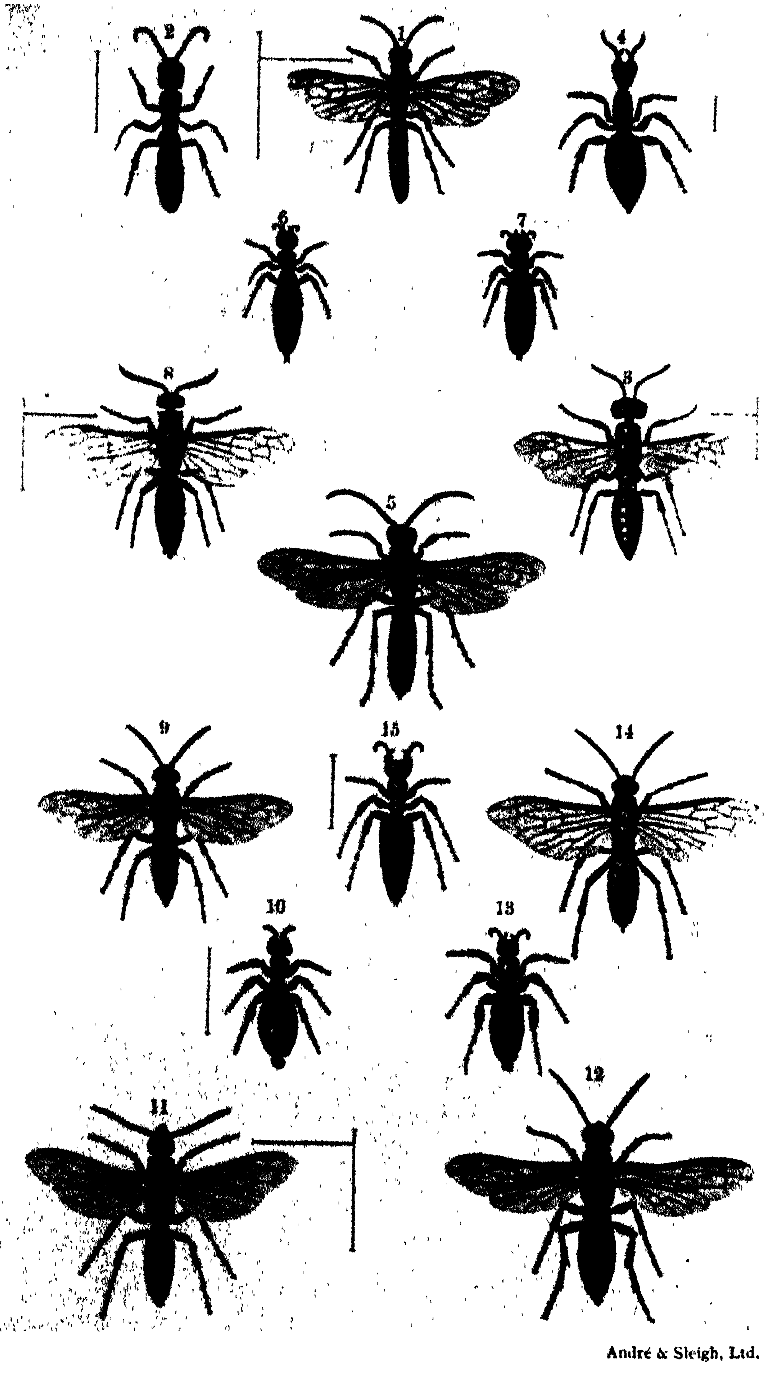
Mr. James F. Ochs, F.Z.S., exhibited twelve heads of Wapiti, *Cervus canadensis typicus*, obtained by Mr. A. Williamson in 1879 on the Piney Range, Rocky Mountains, and the head of a Bison, *Bos bison*, which had formed part of a collection of hunting trophies that had been presented to the Royal Automobile Club by Mr. Williamson.

The following are the measurements in inches of the horns of the five largest Wapiti heads:—

Points	13	16	14	12	16
Length	59, 59½	56, 59	54, 55½	54, 54½	52, 53
Span	50	45	45	42	51
Girth round burr	13	15¼	12	12¼	12½
Girth above burr	10½	12½	10½	11¼	10½

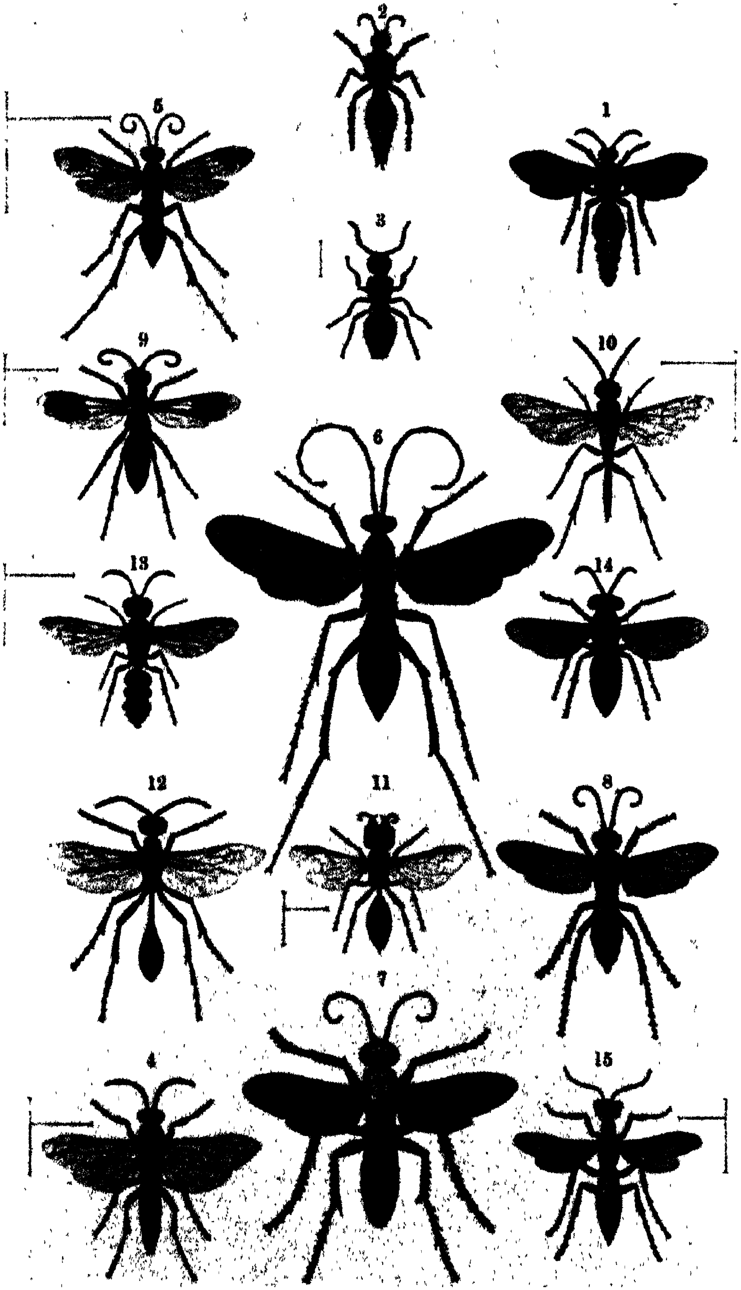
Mr. Charles Urban, F.Z.S., Managing Director of the Natural Colour Kinematograph Co., Ltd., gave a display of motion pictures of animals which had been exhibited hitherto in this country only before T.M. the King and Queen at Knowsley, the Society of Arts, and the Palace Theatre, London. The pictures had been taken, with one or two exceptions, at the Society's Gardens in Regent's Park, and at the National Zoological Park, Washington, U.S.A. Mr. John Mackenzie, the expert who had photographed the animals, introduced and explained the series and the processes which had been employed in obtaining them.

The coloured pictures obtained by the Urban-Smith system of Kinemacolor were particularly successful in reproducing faithfully various shades of yellow, grey, and brown, the films exhibiting the Giraffes feeding and the Elephants bathing being strikingly good, whilst some of the brightly coloured birds were extremely interesting. A series of uncoloured films gave faithful and pleasing representations of various animals in movement, some of them displaying the effect on the animals of gramophone music.



André & Sleigh, Ltd.

P.Z.S., 1910. *Pl. XXXII.*



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AUSTRALIAN FOSSORIAL WASPS.

The following papers were read:—

1. Additions to our Knowledge of the Fossorial Wasps of Australia. By ROWLAND E. TURNER, F.Z.S., F.E.S.

[Received February 16, 1909.]

(Plates XXXI. & XXXII.*)

The material for the following descriptions is nearly all in the British Museum collection, most of the Thynnidæ having been received from Mr. H. M. Giles, and the Ceropalidæ from the collection of the late Gilbert Turner. We may now assume that our material, though very incomplete, is fairly representative of the Fossorial Hymenoptera of Australia. It is most striking that of the species described up to the present time nearly one-half belong to the family Thynnidæ, which is almost entirely without representatives in any other part of the world excepting South America.

The wingless condition of the females must operate against a wide distribution, but I think it quite possible that the family as it exists to-day is derived from less specialised and much more widely distributed ancestors of a form more nearly resembling the modern Scoliidæ. The mouth-parts of the females in most Australian species are almost rudimentary, while in South-American species they are usually developed, so that the degree of specialisation in the two countries differs considerably. I am inclined to believe that the ancestors of the group have been exterminated in the northern continents and Africa by the keener competition existing on large continental areas, and that their descendants have survived on the smaller and more isolated land-areas of the south. In South America the species are very few in the tropical lowlands, but increase in number in the temperate and mountainous regions. In Australia they are most numerous in the south-west and decrease in number as they come into contact with a fauna of a more Oriental character in Queensland. I do not therefore look on the occurrence of the group in such distant localities as any proof of a land connection in the past, but rather regard the South American and Australian species as isolated survivors. The Mutillidæ of Australia mostly seem generically distinct from those of other countries, and the Scoliid genus *Anthobosca* is elsewhere only represented by a few species in South America, South Africa, and Madagascar, but has been found fossil in Colorado. The Ceropalidæ do not show any remarkable peculiarities, being nearly all representatives of wide-ranging genera. It is unfortunate that the old name for this family, Pompilidæ, has to be superseded.

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* For explanation of the Plates see p. 356.

Fam. MUTILLIDÆ.

EPHUTOMORPHA CONDONENSIS, sp. n.

♀. Head much narrower than the thorax, longer than broad, not much produced behind the eyes, rounded at the posterior angles, rather coarsely reticulate. Eyes situated near the middle of the lateral margin of the head, strongly convex and shining. The second joint of the flagellum nearly twice as long as the third. Thorax very coarsely reticulate; the anterior margin straight and produced into tubercles at the angles, more than half as wide again as the posterior margin, which is also produced into tubercles at the angles and obliquely truncate posteriorly; a large lateral tubercle on each side close to the middle of the thorax, behind which the thorax is sharply narrowed, a small rounded tubercle on each side rather nearer to the posterior angle than to the large lateral tubercle. First abdominal segment short, with a short petiole, punctured; second segment very coarsely reticulate, much broader than the first or third segments, convex, feebly depressed and much more finely reticulate on the middle; pygidial area slightly convex, very finely longitudinally striated. Ventral segments rather sparsely punctured. Intermediate and posterior tibiæ with a row of four spines on the outer margin.

Fusco-ferruginous; the head almost black; the vertex covered with long whitish pubescence; a spot at the apex of the first dorsal abdominal, one in the middle of the second segment, and a very small one on each of the following segments covered with whitish pubescence; the apical margins of the ventral segments fringed with pale fulvous pubescence.

Length 12 mm.

♂. Head punctured, a longitudinal carina on the front reaching the anterior ocellus, much narrower than the thorax, strongly rounded behind the eyes. Mandibles with a tooth on the inner margin before the apex; scape finely punctured and pubescent; all the joints of the flagellum except the first longer than broad, the third about half as long again as the second. Eyes strongly convex; posterior ocelli quite as far from each other as from the eyes. Thorax deeply punctured, the mesonotum reticulate in the middle; anterior margin of the pronotum almost straight, the angles slightly produced anteriorly; scutellum strongly convex and subtuberculate; median segment very coarsely reticulate, more than twice as broad as long, the posterior angles tuberculate, very steeply sloped posteriorly. First abdominal segment small with a short petiole; the second very large, coarsely punctured, the punctures more or less confluent longitudinally, somewhat flattened in the middle, with a low longitudinal median carina which does not reach the base or apex, the remaining segments very much narrower and finely punctured. Second ventral segment swollen and subtuberculate at the base. Three cubital cells and two recurrent nervures, the first received just before the middle of the second cubital cell, the second at two-thirds from the base of the third cubital cell; radial cell truncate.

Fusco-ferruginous; head black, covered with grey pubescence; abdomen paler than the thorax, a tuft of white pubescence at the apical angles of the second and third segments, the dorsal segments with sparse black pubescence, white on the apical segment. Legs black. Wings hyaline on the basal third, the remainder fuscous; nervures black.

Length 13 mm.

Hab. Condon, North-West Australia (*H. M. Giles*). February. ♂ ♀ in cop.

Nearly allied to *rugicollis* Westw., which the female strongly resembles in shape and sculpture; but the second segment is somewhat broader in proportion. The male is easily distinguished from *rugicollis* ♂ by the tubercles at the apical angles of the median segment and the broader second abdominal segment. The colour is also very different in both sexes. The two species both occur in the Condon district.

EPHUTOMORPHA COCYTIA, sp. n.

♀. Black, clothed with long black hairs, the hairs at the apex of the second and third ventral segments greyish; the four apical ventral segments testaceous brown at the base. Mandibles smooth and shining, almost straight, with a small blunt tooth on the inner margin. Head narrower than the thorax, rounded at the posterior angles, strongly narrowed and produced anteriorly, finely punctured rugose with a few longitudinal striæ on the front. Scape punctured, clothed with long black pubescence; flagellum opaque, the two basal joints shining. Thorax very coarsely rugose, transverse on the anterior margin, about twice as long as the width on the anterior margin, slightly widening to before the middle, then gradually narrowing to the posterior margin, which is not more than two-thirds as wide as the anterior. Pleuræ shining and almost smooth. Second dorsal segment coarsely rugose; segments 3–5 punctured, the apical segment without hairs, finely longitudinally striated; second segment shallowly but rather broadly depressed in the middle. First ventral segment strongly carinated longitudinally; the second rugose in the middle, punctured at the base and apex, depressed on each side at the base, leaving a low carina in the middle between the depressed spaces, the apical margin very broadly depressed.

Length 14 mm.

Hab. Condon, N.W. A. (*H. M. Giles*), 3 ♀. Cossack, W. A. (*Walker*), 1 ♀.

In specimens which have lost some of the pubescence on the head, and the sculpture shows more plainly, there can be seen a carina on each side starting from the antennal tubercle and arching toward the eye, and a short transverse carina at the base of the clypeus. The second joint of the flagellum is nearly half as long again as the third. The eyes are large and prominent, situated nearer to the occiput than to the base of the mandibles.

Ephutomorpha gilesi, sp. n. (Plate XXXII. figs. 1 ♂, 2 ♀.)

♀. Mandibles slightly bent at the base, straight and pointed at the apex, with a strong tubercle on the outer margin near the base, the inner margin apparently without teeth. Head much narrower than the thorax, rounded at the posterior angles, deflexed and narrowed anteriorly, finely and shallowly punctured, a curved carina on each side running from the antennal tubercle nearly to the eye; the head below the carina strongly depressed. Scape punctured and clothed with long greyish-white pubescence; the second joint of the flagellum nearly half as long again as the third. Eyes large, strongly convex, situated much nearer to the occiput than to the base of the mandibles. Thorax very coarsely reticulated, pro- and mesopleuræ coarsely punctured; the thorax pyriform, straight on the anterior margin, narrowed and steeply sloped posteriorly, strongly convex. First abdominal segment short, shining, sparsely and finely punctured, much narrower than the second, which is strongly raised at the base above the first, shining and sparsely but very coarsely and deeply punctured, with a very large, cordiform, shallow depression in the middle, more finely punctured; the third, fourth, and fifth segments finely and closely punctured; the apical segment without hairs, longitudinally striated. First ventral segment with a strong carina; second segment subtuberculate at the base in the middle and slightly depressed on each side, very coarsely but rather sparsely punctured, the apical margin strongly and broadly depressed; the remaining segments delicately reticulate at the base, closely and finely punctured at the apex.

Black, clothed with greyish pubescence, longest and closest on the head and sides of the thorax and abdomen and everywhere interspersed with long, erect, black hairs; a patch of silver-white pubescence at the apex of the five basal abdominal segments, that on the first the largest and with the hairs directed forward; the depression on the second dorsal segment clothed with grey pubescence.

Length 14-18 mm.

♂. Mandibles a little curved, with a feeble tooth on the inner margin, pointed at the apex. Head small, much narrower than the thorax, closely and finely punctured and covered with greyish pubescence; strongly rounded behind the eyes, without distinct posterior angles. Eyes large and convex, situated not very far from the base of the mandibles; the ocelli small, the two posterior ocelli much nearer to each other than to the eyes. Scape punctured above and clothed with long pubescence, shining beneath and deeply hollowed; the second joint of the flagellum much shorter than the third. Thorax closely and finely punctured, the pronotum slightly narrowed anteriorly and rounded at the angles, clothed with long and very pale fulvous pubescence, the pubescence on the mesonotum and scutellum shorter and black; the scutellum subtriangular; the tegulæ smooth, with a few punctures near the apex. Median segment very coarsely reticulated, very steeply sloped posteriorly. Abdomen finely and closely punctured, with long black pubescence on the side; the first segment short, much narrower than the second, moderately constricted at the apex; the apical segment smooth and shining, with a low median carina, rather broadly truncated at the apex. Radial cell broadly truncated at the apex; three cubital cells, the first recurrent nervure received beyond the middle of the second cubital cell, the second less distinct and interstitial with the third transverse cubital nervure. Second ventral segment tuberculate at the base beneath.

Black; a small pointed patch of white pubescence at the apex of each dorsal segment, except the first and seventh. Wings dark fuscous, nervures black.

Length 17 mm.

Hab. Carlindia, North-West Australia, ♂ ♀ in cop.; Strelley River, N.W. A., 2 ♀ (*H. M. Giles*).

The female may be readily distinguished from other species of the genus by the large depression on the second dorsal segment. The shape approaches very nearly to the last species (*cocytia*).

EPHUTOMORPHA PERELEGANS, sp. n. (Plate XXXII. fig. 3, ♀.)

♀. Head closely and not very finely punctured, nearly as broad as the thorax, broadly rounded behind the eyes, without posterior angles, a little narrowed anteriorly; an oblique carina on each side reaching from the antennal tubercle to the eye. Antennæ as long as the thorax, the third joint of the flagellum as long as the second. Eyes large and moderately convex, situated nearer to the posterior margin of the head than to the base of the mandibles. Thorax very coarsely punctured, the punctures confluent longitudinally on the posterior half, not more than one-quarter as long again as the greatest breadth, narrowed gradually from the middle and nearly half as broad again on the anterior as on the posterior margin, the anterior margin slightly arched, obliquely sloped posteriorly. Pleuræ almost smooth. Abdomen ovate, the basal segment short and not very narrow; finely and closely punctured; the pygidial area finely longitudinally striated and rather narrowly rounded at the apex.

Ferruginous red, with sparse erect pubescence, black on the abdomen, dark brown on the head and thorax; the abdomen, except the basal segment, and the nine apical joints of the flagellum black. A broad longitudinal band of whitish pubescence on the middle of the dorsal surface of the abdomen from the base of the second segment to the apex of the fifth; the pubescence on the sides and ventral surface of the abdomen sparse and whitish.

Length 5 mm.

Hab. Townsville, Q. (*F. P. Dodd*).

Somewhat allied to *E. aurigera* Bingh., from the same locality, but the thorax is much shorter and broader and also more coarsely sculptured in the present species. It is remarkable that many species were collected by Mr. Dodd at Townsville which are not represented in the extensive collections of the Mutillidæ formed by Mr. Gilbert Turner at Mackay and Cairns. The range of many species, at all events from north to south, must be extremely limited.

EPHUTOMORPHA LABECULATA, sp. n.

♀. Head closely and rather coarsely punctured, a little broader than the thorax, short and narrowed behind the eyes, without distinct angles, narrowed anteriorly; the carinæ from the antennal tubercles ill-defined and not reaching the eyes. Second joint of the flagellum distinctly longer than the third. Eyes large and very strongly convex, nearer to the occiput than to the base of the mandibles. Thorax finely and very closely punctured-rugose, broadest in the middle, a little longer than the greatest breadth, the anterior margin straight, about one-quarter broader than the posterior margin, the angles not prominent; the posterior truncation almost vertical, the lateral margins feebly serrate. Abdomen ovate, very finely and closely punctured, the pygidium very finely longitudinally striated.

Black, with sparse, erect, grey pubescence; the apex of the first dorsal segment of the abdomen testaceous; the head and apex of thorax sparsely covered with recumbent silvery pubescence, an oval spot of silver pubescence on each side of the second dorsal segment, a transverse band at the apex of the same segment, and a broad longitudinal band on the middle of the third, fourth, and fifth segments also of silver pubescence.

Length 5 mm.

Hab. Townsville, Q. (*F. P. Dodd*), June.

EPHUTOMORPHA ANCHORITES, sp. n.

♀. Head subrectangular, slightly rounded at the posterior angles, broader than long, as broad as the thorax, evenly but not very closely punctured; a carina on each side from the antennal tubercle not reaching the eye. Second joint of the flagellum distinctly longer than the third; the flagellum rather stout in the middle, the joints longer than broad. Eyes convex, not very large, situated a little nearer to the base of the mandibles than to the occiput. Thorax longer by one-third than the breadth on the anterior margin, the sides nearly parallel, slightly narrowed behind the middle, almost vertically truncate posteriorly, the anterior margin straight, coarsely reticulate; the pleuræ almost smooth. Abdomen subovate, the second segment evenly but not very closely punctured, the remaining segments much more finely punctured; the basal segment very short, depressed below the base of the second segment. Apical dorsal segment deflexed, elongate triangular, and finely longitudinally striated.

Entirely ferruginous brown, with sparse grey pubescence; the mandibles and pygidial area darker; a very small patch of silver pubescence in the middle of the apical margin of the first and second dorsal segments.

Length 6 mm.

Hab. Hermannsburg, Central Australia (*H. J. Hillier*).

Well distinguished from most species of the genus by the broad head and thorax; in most of the species of the genus in which the head is broad and rectangular, the thorax is very much narrower than the head.

Fam. THYNNIDÆ.

The material in this family dealt with here is mainly derived from the splendid collection sent by Mr. H. M. Giles from South-Western Australia to the British Museum. Some other species described are from the collection of the Berlin Museum and from collections sent to me by Messrs. G. A. Waterhouse and R. Illidge. Mr. Giles has also furnished valuable information as to the habits of the species. He says that, in spite of the minute mouth-parts, the females do take food, though exclusively liquid. This, he has observed in many species, is disgorged by the males and placed in the mouth of the female, which is carried by the male for some hours. The larger females also help themselves. In a female examined for me by Mr. W. Wesché there was no trace of pollen, though the specimen had been taken on *Leptospermum*-blossom by Mr. Illidge; whereas in the South-American female *Spilothynnus bituberculatus* Turn. a good deal of pollen was to be found, showing that the more normal mouth of the South-American females is associated with a difference in feeding-habits. In several cases Mr. Giles captured specimens cross-paired, males of the same species being taken carrying widely different females. There can here be no question as to any mistake in the observation, Mr. Giles being a most careful observer. Professor Dahl observed in New Britain that the female of *Thynnus serriger* Sharp is to be found on leaves with the mandibles wide open, probably for the purpose of seizing the male. I am inclined to think that the male may be used in this way as a means of transport, and that the strongly developed claspers may be used in carrying the female without coupling actually taking place in cases where the two are of different species. On the other hand, occasional cross-pairing among the more nearly allied species is not wholly improbable. Mr. Giles has also observed a male of one species going into a *Bembex*-burrow and returning coupled with a female. On digging up more *Bembex*-burrows he succeeded in finding another female of the same species, thus showing that my suggestion that some of the smaller species are parasitic on *Bembex* is almost certainly correct.

RHAGIGASTER UNICOLOR Guér. st. LYELLI, nom. n.

Rhagigaster unicolor Guér. st. *mandibularis* Turn. Proc. Linn. Soc. N.S.W. xxxii. p. 217 (1907) (nec *R. mandibularis* Westw.).

♂. The second cubital cell is only about three-fifths of the length of the third on the radial nervure, whereas in typical *unicolor* it is fully four-fifths of the length.

It is possible that this may prove to be a sufficiently distinct species, but I have not seen the two forms from the same locality.

A pair taken *in copulâ* by Mr. G. Lyell at Gisborne, Victoria, in February.

RHAGIGASTER FUSCIPENNIS Sm.

Rhagigaster fuscipennis Sm. Descr. n. sp. Hym. p. 175 (1879), ♂ (nec Turn. Proc. Linn. Soc. N.S.W. xxxii. p. 218, 1907).

Rhagigaster gracilior Turn. Proc. Linn. Soc. N.S.W. xxxii. p. 223 (1907), ♂ ♀.

My identification of Smith's species was mistaken; it is therefore necessary to give a name to the species described by me as *fuscipennis* Sm.:—

RHAGIGASTER NIGRITULUS, nom. n.

Rhagigaster fuscipennis Turn. Proc. Linn. Soc. N.S.W. xxxii. p. 218 (1907), ♂ ♀ (nec Smith).

RHAGIGASTER ANALIS Westw.

Rhagigaster analis Westw. Arc. Ent. ii. p. 106 (1844), ♀.

Rhagigaster tristis Sm. Cat. Hym. B. M. vii. p. 63. n. 13 (1859), ♂.

Rhagigaster nitidus Sm. Cat. Hym. B. M. vii. p. 63. n. 16 (1859), ♀.

Several pairs taken *in cop.* by Mr. H. M. Giles in the neighbourhood of Perth. The female is a true *Rhagigaster*, having the lateral grooves on the head; but the male is without the frontal carina between the eyes which is usually present in males of that group. This shows plainly that my genus *Rhytidogaster* cannot stand, there being no sufficiently distinguishing points between the males. In some of the males sent by Mr. Giles the second recurrent nervure is interstitial with the second transverse cubital nervure, and the size varies from 12 to 15 mm.

RHAGIGASTER CINERELLUS, sp. n.

♂. Mandibles bidentate, the inner tooth very large; clypeus very short and broad, not produced in the middle, the anterior margin almost straight, convex, with a carina from the base to the middle, obliquely and very broadly triangularly depressed from the middle to the apex, the margins of the oblique space and the apical margin raised, forming low carinæ. Antennæ inserted low down, on the sides of the clypeus, about as long as the thorax and median segment combined, rather stout, the apical joints slightly arcuate, the prominence between the antennæ not developed. Head rather coarsely punctured, more finely and closely on the front than on the vertex; no transverse carina, but the front is sharply depressed a little in front of the anterior ocellus. Posterior ocelli about two and a half times as far from the eyes as from each other. Thorax closely punctured; the scutellum rather narrowly truncate at the apex, convex. Median segment rather short, more finely punctured. Abdomen fusiform, shallowly and not very closely punctured, the punctures rather larger than on the thorax; the segments slightly constricted at the base, with a sparse fringe of short white hairs on the apical margin. Seventh dorsal segment more deeply and coarsely punctured, rounded at the apex. Hypopygium ending in a recurved spine which does not reach far beyond the dorsal segment, without lateral spines. Second recurrent nervure received at the base of the third cubital cell, not quite interstitial with the second transverse cubital nervure; second abscissa of the radius a little shorter than the third.

Black; the legs fuscous. Wings pale fusco-hyaline, nervures fuscous.

Length 13 mm.

Hab. Cape York, Q. (*Daemel*).

Type in Berlin Museum.

Daemel's localities are not always accurate, and may have to be corrected in the future.

The present species is very distinct, the very broad short clypeus and strongly bidentate mandibles distinguishing it from other species of the genus. The fusiform abdomen and the short hypopygium point to a connection with the next-described species, *interstitialis*.

RHAGIOGASTER INTERSTITIALIS, sp. n.

♂. Clypeus short and broad, opaque and punctured, clothed with long grey hairs, with a low carina from the base, branching in the middle and forming a Λ-shaped carina which reaches the anterior margin. Antennæ as long as the thorax, stout and of almost even thickness throughout. Head rugose, broader than the pronotum, with an oblique carina above the base of each antenna; without a transverse frontal carina. Thorax and median segment finely and closely punctured, most closely on the median segment; mesopleuræ rugose. Pronotum a little narrowed anteriorly, the angles not prominent. Scutellum almost triangular, very narrowly rounded at the apex, the sides strongly depressed. Median segment shorter than the pronotum, subtruncate or very steeply sloped posteriorly, the posterior surface striolated. Abdomen as broad as the thorax, stout, about one-third longer than the head and thorax combined, very finely and closely punctured; segments 2–5 with a depressed transverse line near the base and a low transverse carina emarginate posteriorly in the middle near the apex. Seventh dorsal segment very narrow at the apex. Hypopygium ending in a recurved spine, shortly and less strongly recurved than is usual in the genus. Second recurrent nervure interstitial with the second transverse cubital nervure; the second cubital cell about two-thirds as long as the third on the radial nervure; the division of the first cubital cell clearly marked.

Opaque black; the spines of the tibiæ and tarsi testaceous. Wings fusco-hyaline, nervures black, stigma fuscous.

Length 15 mm.; exp. of wings 24 mm.

Hab. Hermannsburg, Central Australia (*H. J. Hillier*). April.

A very distinct species, shorter and more stoutly built than is usual in the genus. The female will probably prove to belong to *Rhytidogaster* Turn. rather than to *Rhagigaster*; but the males of the two groups are not distinguishable with any certainty, and I think *Rhytidogaster* must sink.

RHAGIGASTER CORRUGATUS, sp. n. (Plate XXXI. figs. 1 ♂, 2 ♀.)

♂. Clypeus finely and closely punctured at the base and on the sides, with a short longitudinal carina from the base, which branches before the middle into two almost obsolete carinæ, these enclosing with the apical margin a shining triangular space marked with a few large and sometimes confluent punctures; the apical margin almost straight, very broadly and feebly emarginate. Antennæ scarcely as long as the thorax without the median segment, of almost even thickness throughout, inserted further from each other than from the eyes. Vertex shining, rather strongly punctured, with an almost obsolete longitudinal carina behind the ocelli; front coarsely rugose, with an arched carina not extending to the eyes below the anterior ocellus and a broadly V-shaped carina between the antennæ, the branches not extending to the arched carina. Thorax closely and rather strongly punctured; the pronotum nearly as broad as the head; the anterior margin straight and raised, with a shallow groove behind it, the anterior angles moderately prominent. Scutellum subtriangular, narrowly truncate at the apex. Median segment rounded, finely and closely punctured. Abdomen elongate, nearly half as long again as the head and thorax combined, shining, strongly but not very closely punctured, much more closely than in *R. unicolor* Guér.; the segments strongly constricted near the base, the base of the segments where visible closely and very minutely punctured. First ventral segment with a small acute tubercle at the base. Seventh dorsal segment sharply depressed at the apex and produced into a small, flattened, smooth plate, rounded at the apex; the hypopygium not extending much beyond the dorsal process, forming a very sharply recurved spine with a minute spine on the upper surface and without lateral spines at the base. Second recurrent nervure received close to the base of the third cubital cell, nearer the base than in *R. unicolor*.

Black, with sparse whitish pubescence; the pubescence on the head cinereous. Wings very pale fusco-hyaline, faintly flushed with purple, the radial cell narrowly fuscous along the costa; nervures black.

Length 17 mm.

♀. Mandibles bidentate, the inner tooth short and blunt. Maxillary palpi short, six-jointed; labial palpi four-jointed; labrum transverse and strongly ciliated, borne on a narrow petiole. Clypeus shining and almost smooth, the anterior margin truncate, a carina from the base almost reaching the apex. Head quadrate, slightly rounded at the posterior angles, very coarsely longitudinally rugose. Thorax and abdomen very coarsely longitudinally striated, the striæ most regular on the abdomen, more broken and irregular on the median segment; the sixth dorsal segment and the ventral surface sparsely punctured. Pronotum more than half as broad as the head, rectangular, half as broad again as long, the mesopleuræ showing a distinct dorsal surface on each side of the scutellum. Median segment as long as the pronotum, broadened from the base to the apex, obliquely truncate posteriorly, the surface of the truncation punctured. Abdominal segments almost smooth at the base when extended, the first ventral segment with a small acute tubercle at the base; the sixth dorsal segment shallowly emarginate at the apex and not quite reaching the apex of the ventral segment.

Black; the flagellum, the mandibles (except at the apex), the upper surface of the head from the base of the antennæ to the posterior margin, the tarsi, and the spines of the tibiæ dull fulvo-ferruginous.

Length 11-13 mm.

Hab. Woodford, N.S.W. (*G. A. Waterhouse*), ♂ ♀ in cop. Victoria (*Berlin Museum*), ♀.

Described from three males and three females.

This remarkable species is very near *R. unicolor* Guér. in the male sex, except in the anal segment. But the female is completely distinct, and shows that my genus *Rhytidogaster* cannot be maintained as distinct from *Rhagigaster*, unless by the character of the oblique grooves on the head of the female, which are wanting in this species.

RHAGIGASTER CASTANEUS Sm.

Rhagigaster castaneus Sm. Cat. Hym. B. M. vii. p. 63. n. 15 (1859), ♀.

♂. Clypeus with a prominent longitudinal carina from the base to the middle, finely rugulose, shining at the apex, and rather narrowly truncate. Head rugose on the front, coarsely punctured on the vertex; the interantennal carina well defined, V-shaped; a low, frontal, longitudinal carina not reaching the anterior ocellus; no transverse carina between the eyes. Pronotum as broad as the head, closely and not very coarsely punctured, the anterior margin straight and strongly raised, the angles slightly prominent. Mesonotum, mesopleuræ, and scutellum coarsely punctured-rugose: the scutellum triangular, almost pointed at the apex. Median segment finely and very closely punctured, rounded at the sides, short and steeply sloped posteriorly. Abdomen elongate, the segments constricted near the base, the extreme base very finely punctured, the apical portion more sparsely and coarsely punctured, with a large smooth patch on each side near the apical margin; the seventh dorsal segment with a tubercle on each side at the apex, prolonged between the tubercles into a short narrow process, which is as broad as long and truncate at the apex. Hypopygium ending in a long recurved spine. The position of the second recurrent nervure is rather variable, being received by the third cubital cell from one-fifth to one-quarter from the base; the division of the first cubital cell is well marked, but not quite complete.

Black, the two apical abdominal segments ferruginous red. Wings hyaline, slightly tinted with fuscous, nervures black. The ventral segments are fringed at the apex with white pubescence.

Length 14–15 mm.

Hab. South Perth, W. A (*H. M. Giles*), ♂ ♀ in cop.

"On *Leptospermum* bloom. Not common" (*Giles*).

RHAGIGASTER ACULEATUS Sauss.

Rhagigaster aculeatus Sauss. Reise Novara, Zool. ii. Hym. i. p. 113 (1867), ♂.

Rhytidogaster aculeatus Turn. Proc. Linn. Soc. N.S.W. xxxii. p. 235 (1907), ♂.

♀. Differs from the female of *aculeatus* st. *acutangulus* Turn. in the shorter and broader head, which is rather less than half as long again as broad in the typical form, and considerably more than half as long again as broad in st. *acutangulus*. The mandibles have a short blunt tooth on the inner margin.

Hab. Woodford, N.S.W. (*G. A. Waterhouse*), ♂ ♀ in cop.

EIRONE SCHIZORHINA, sp. n.

♂. Clypeus convex, narrowly produced and strongly porrect, deeply and narrowly emarginate at the apex, the angles of the emargination produced into short spines; closely and finely punctured; with an obscure median carina from the base to the middle. Head and pronotum shining, shallowly and not very closely punctured, the head slightly narrowed behind the eyes, but broader posteriorly than the pronotum. Antennæ inserted as far from each other as from the eyes; the interantennal prominence very small and low, V-shaped; a small longitudinal depression halfway between the anterior ocellus and the base of the clypeus; antennæ a little longer than the thorax without the median segment, the apical joints slightly arcuate. Anterior margin of the pronotum strongly raised; mesonotum and scutellum closely punctured. Median segment smooth and shining at the base, finely and very closely punctured rugulose beyond the shining area which is divided by a very short longitudinal sulcus, the segment gradually sloped posteriorly, not truncate. Abdomen rather shorter than the head, thorax, and median segment combined, tapering slightly at the extremities, the segments rather closely punctured at the base, smooth and shining at the apex. Hypopygium rounded, not projecting beyond the dorsal segment. Third abscissa of the radius longer than the second; second recurrent nervure received just beyond one-quarter from the base of the third cubital cell.

Black, with sparse grey pubescence; mandibles, tegulæ, femora, tibiæ, and tarsi ochreous. Wings hyaline, nervures fuscous.

Length 10 mm.

Hab. New South Wales (*Staudinger*), 2 ♂.

Type in Berlin Museum.

This species approaches *lucidus* Sm., but may easily be distinguished by the remarkable form of the clypeus.

EIRONE RUFICORNIS Sm.

Thynnus (*Agriomyia*) *ruficornis* Sm. Cat. Hym. B. M. vii. p. 34 (1859), ♂.

Eirone ruficornis Turn. Proc. Linn. Soc. N.S.W. xxxii. p. 265 (1907), ♂.

♀. Head rectangular, very slightly rounded at the posterior angles, longer than broad, very sparsely and minutely punctured, with a short, longitudinal, frontal sulcus; the mandibles stout, blunt at the apex, bidentate; antennæ fully half as long again as the head. Thorax very sparsely punctured; the pronotum longer than broad, very slightly narrowed anteriorly, a little shorter than the median segment; scutellum rather broader than long, the mesopleuræ showing a distinct dorsal surface on each side of it; the median segment longer than broad and slightly broadened posteriorly. Abdomen elongate, subcylindrical, sparsely and finely punctured, the punctures more or less elongate; the basal segment shorter than the second, almost as broad at the base as at the apex; the pygidium without a carina, rounded at the apex.

Shining black; the prothorax and median segment ferruginous; legs, antennæ, mandibles, and pygidium fusco-ferruginous.

Length 7 mm.

Hab. Claremont, W. A. (*H. M. Giles*). December. ♂ ♀ in cop. "On *Eucalyptus* bloom."

EIRONE FERRUGINEICORNIS, sp. n. (Plate XXXI. fig. 3, ♂.)

♂. Clypeus strongly convex at the base, raised and subcarinate in the middle, flattened towards the apex, produced anteriorly and rather narrowly truncate on the apical margin. Head and thorax shining and rather sparsely punctured; the head broadly emarginate posteriorly, not narrowed behind the eyes; antennæ as long as the thorax without the median segment, filiform, a little more slender towards the apex. Pronotum scarcely narrowed anteriorly, the anterior margin slightly raised; propleuræ shining; mesopleuræ closely punctured. Scutellum narrowly truncate at the apex. Median segment granulated, short, abruptly truncate posteriorly, the surface of the truncation punctured rugulose. Abdomen fusiform, shorter than the head and thorax combined, shining and very minutely punctured; the seventh segment rounded at the apex, smooth; the hypopygium not prominent, simple, rounded at the apex. Third cubital cell longer than the second on the radial nervure, receiving the second recurrent nervure just before one-third from the base. The division of the first cubital cell is not marked.

Black; the antennæ, mandibles, prothorax, and legs ferruginous; the apex of the clypeus pale yellow. Wings hyaline; the stigma ferruginous; nervures pale testaceous, almost colourless.

Length 8 mm.

Hab. Hermannsburg, Central Australia (*H. J. Hillier*).

EIRONE MONTIVAGA, sp. n.

♂. Clypeus convex, with a carina from the base not reaching the apex, without a triangular truncation at the apex, closely and microscopically punctured. Antennæ shorter than the thorax and median segment combined, inserted nearer to each other than to the eyes, the apical joints slightly arcuate; the interantennal prominence V-shaped and touching the base of the clypeus. Head shining, closely and not very finely punctured, the posterior ocelli more than twice as far from the eyes as from each other. Thorax rather more finely punctured than the head, especially on the pronotum, which is almost smooth, with the anterior margin raised. Scutellum nearly triangular, narrowly rounded at the apex. Median segment no longer than the pronotum, obliquely sloped posteriorly, finely aciculate, closely punctured on the posterior slope. Abdomen slightly fusiform, shorter than the head and thorax combined, shining, minutely punctured, the apical segment rounded at the extremity, the hypopygium rounded and ciliated, not projecting beyond the dorsal plate. Claspers broad and short, the apex with a fringe of long curved hairs. Second cubital cell a little more than half as long as the third on the radial nervure.

Black; the anterior margin of the clypeus, two minute spots between the antennæ, the anterior margin of the pronotum broadly interrupted in the middle, an oblique line on each side at the posterior angle of the pronotum, and the spines of the tibiæ white. Wings hyaline, faintly iridescent, nervures black.

Length 6 mm.

♀. Head rectangular, nearly one-third as long again as broad, slightly rounded at the posterior angles, smooth and shining; the eyes very small, ovate, not touching the base of the mandibles. Thorax and median segment very sparsely punctured; the pronotum a little shorter than the median segment, slightly narrowed anteriorly; scutellum nearly half as long as the pronotum, the mesopleuræ showing a distinct dorsal surface on each side of it. Median segment twice as long as the breadth at the base, flattened above and slightly broadened from the base to the apex. Abdomen shining, shallowly and finely punctured, the punctures elongate; first segment vertically truncate at the base, not very short, not very narrow at the base; the pygidium pointed. The abdomen is broadened in the middle, not cylindrical.

Entirely castaneous brown.

Length 5 mm.

Hab. Woodford, N.S.W. (*G. A. Waterhouse*), ♂ ♀ in cop.

Described from two pairs.

Nearest to *vitripennis* Sm., but the clypeus of the male is without the triangular truncation at the apex, and the abdomen of the female is shorter and less cylindrical, in addition to other differences.

TACHYNOMYIA DISJUNCTA, sp. n.

♂. Clypeus narrowly produced and truncate at the apex, very coarsely punctured, the apical margin smooth. Cheeks at the base of the mandibles produced into an acute spine. Head rugose; the interantennal prominence very broadly rounded and feebly bilobed, divided by a short, obscure, longitudinal carina. Antennæ as long as the head, thorax, and median segment combined, inserted nearer to each other than to the eyes, the apical joints slender and arcuate. Ocelli very close together, the posterior ocelli about three times as far from the eyes as from each other; the head strongly concave beneath, the lateral fringe of hairs very long and grey. Apical joints of the maxillary palpi not very long or slender. Posterior margin of the head slightly arched, not emarginate. Pronotum shining, almost smooth, much narrower than the head, the anterior margin raised. Thorax and median segment closely punctured, finely on the median segment, more strongly on the mesonotum; the scutellum large, broadly truncate at the apex. Abdomen broadened from the base, closely and deeply punctured, much more sparsely on the ventral than on the dorsal surface; the second ventral segment very deeply separated from the first and produced at the base into a large and prominent tubercle. Hypopygium broadly rounded, with an acute apical spine.

Black; the mandibles, the apex of the clypeus, and the apex of the interantennal prominence very narrowly whitish yellow; the apex of the tegulæ, the apex of the femora, the tibiæ, tarsi, the second and third ventral segments, and the apical margin of the first, second, and third dorsal segments very narrowly dark ferruginous. Wings hyaline, very faintly clouded with fuscous, nervures black, stigma fuscous.

Length 14 mm.

♀. Head rather thick, subrectangular, more than half as broad again as long, slightly rounded at the posterior angles, shining, with large scattered punctures, the clypeus with a carina. Thorax and median segment shining, very sparsely punctured; the pronotum narrower than the head, half as broad again on the anterior margin as long, narrowed posteriorly, no broader on the posterior margin than long; scutellum short, much broader than long. Median segment as long as two-thirds of the pronotum, slightly broadened posteriorly and sharply truncate. Abdomen broader than the thorax, sparsely punctured, very finely at the base of the segments, more coarsely at the apex; the first segment vertically truncate at the base, the dorsal surface finely longitudinally striated between deep scattered punctures; the second segment finely and closely longitudinally striated, the apical margin feebly raised, with a narrow groove before it. Pygidium broad, not truncate or compressed, longitudinally striated, broadly rounded at the apex, the dorsal plate narrowed at the extreme apex. Ventral surface shallowly but coarsely punctured, most finely on the fifth segment. A minute spine on the mesopleuræ close to the base of the intermediate coxæ. Tarsal ungues bidentate.

Fusco-ferruginous; the head (except the mandibles and antennæ), the scutellum, median segment, and stains near the apex of the third, fourth, and fifth dorsal abdominal segments black.

Length 13 mm.

Hab. South Perth, W. A. (*H. M. Giles*). November. ♂ ♀ in cop.

TACHYNOMYIA AURICOMATA, sp. n.

♂. Head punctured-rugose, clothed with long golden pubescence, thin on the vertex, close on the clypeus, and forming the usual fringe of long curved hairs on the cheeks; the clypeus slightly convex and more broadly truncate at the apex than in most of the allied species. Antennæ as long as the thorax and median segment combined, the apical joints feebly arcuate, inserted nearer to each other than to the eyes; the interantennal prominence bilobed. Pronotum very shallowly punctured, the remainder of the thorax and the pleuræ more closely and deeply punctured; the anterior margin of the pronotum raised, much narrower than the head; thorax with sparse golden, pleuræ with white pubescence. Median segment punctured-rugulose. Abdomen shining, fusiform, very shallowly punctured, segments 2–4 with a faintly raised curved mark on each side near the apex; the first segment narrowed at the base, with a longitudinal sulcus from the base to the middle, the second segment depressed at the base. Hypopygium with the sides parallel close to the base, then triangular, with a short apical spine.

Black; the apex of the mandibles, the femora, tibiæ, and tarsi ferruginous. Wings hyaline, nervures fuscous, the stigma ferruginous.

Length 10 mm.

Hab. The locality is given on the label as Endeavour River, Queensland, but others from the same source and similarly labelled are Victorian, so probably this species is also from Victoria.

The palpi are not very slender, but the three apical joints of the maxillary palpi are longer than the others. In all species of *Tachynomyia* which I have taken in North Queensland these three apical joints are very long and slender.

Type in the Berlin Museum.

ZELEBORIA OLIVEI, sp. n.

♂. Clypeus produced and rather narrowly truncate at the apex, very finely punctured, clothed with short white pubescence. Head finely and very closely punctured; the interantennal prominence not very broad, deeply bilobed at the apex; the antennæ filiform, slender, nearly as broad as the head, thorax, and median segment combined; ocelli very near together, the posterior pair more than twice as far from the eyes as from each other; the three apical joints of the maxillary palpi long and slender, the galea with a faintly marked dividing-line; the fringe on the sides of the head sparse and white. Thorax rather slender, narrower than the head, closely and finely punctured; the pronotum very finely punctured, with the anterior margin strongly raised. Median segment very finely rugulose, almost smooth at the base. Scutellum rather narrowly truncate at the apex, with an obscure longitudinal carina. Abdomen slender, elongate-fusiform, smooth and shining, the division between the two basal ventral segments scarcely marked. Hypopygium rounded, with an acute apical spine.

Black; the tegulæ fuscous. Wings very pale fusco-hyaline, nervures fuscous.

Length 14 mm.

Hab. Cooktown, Q.

A slenderer species than *longicornis* Turn.

PHYMATOTHYNNUS NITIDUS Sm.

Thynnus (*Agriomyia*) *nitidus* Sm. Cat. Hym. B. M. vii. p. 30 (1859), ♂.

♂. The apical joints of the antennæ are arcuate beneath.

♀. Mandibles falcate, slender and pointed; clypeus with a very short carina from the base not reaching the middle. Head very slightly convex, twice as broad anteriorly as long, strongly rounded at the posterior angles, rather sparsely but not finely punctured, each puncture bearing a pale fulvous hair; a fine and short frontal sulcus. Antennæ inserted nearly as far from each other as from the eyes, the front between them not bituberculate. Thorax and median segment shining and almost smooth; the pronotum about half as wide as the head, rectangular, nearly as long as broad, with two small tubercles on the anterior margin. Median segment raised into a hump-like tubercle just behind the scutellum, then obliquely depressed and strongly concave on the sides, broadened from the base, the depressed surface longer and narrower than the pronotum. First abdominal segment rather narrowly truncate anteriorly, shining, finely and sparsely punctured, the dorsal surface nearly as long as the second segment, the apical margin narrowly depressed; second segment transversely rugose between two transverse carinæ, the apical margin strongly raised; segments 3–5 very delicately punctured-rugulose, with a few large scattered punctures. Ventral segments coarsely punctured-rugose. Pygidium not constricted at the base, vertically truncate, the surface of the truncation ovate; the dorsal plate obliquely rugulose with a strong median longitudinal carina, nearly as long as the ventral plate. Tarsal ungues bidentate.

Head, thorax, and legs ferruginous; abdomen black; the apex of the pygidium fusco-ferruginous.

Length 9 mm.

Hab. Claremont, W. A. (*H. M. Giles*). December. ♂ ♀ in cop. "On *Eucalyptus* bloom."

GLAPHYROTHYNNUS SITIENS Turn.

Thynnus (*Glaphyrothynnus*) *sitiens* Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 112 (1908), ♂.

♂. The spine on each side near the base of the hypopygium mentioned in the original description is really only a protrusion of the apex of the claspers in the type specimen. As in other species of this difficult group, the extent of the yellow markings is variable.

♀. Head fully twice as broad anteriorly as long, strongly rounded at the posterior angles, shining, with a few scattered punctures, more closely punctured on the front than on the vertex. Antennæ inserted much farther from each other than from the eyes; the joints of the flagellum much broader than long and produced at the apex beneath. Pronotum much narrower than the head, nearly twice as broad on the anterior margin as long, narrowed posteriorly, finely and sparsely punctured, with a row of long white hairs on the anterior and lateral margins. Scutellum transverse. Median segment short, scarcely longer than the scutellum, very sparsely punctured, the punctures piliferous, steeply sloped posteriorly. Abdomen impunctate, except at the apex of the raised portion of the first, fourth, and fifth segments; the first dorsal segment divided transversely into two almost equal portions, the apical portion depressed and smooth, the apical margin very feebly raised; second segment with four transverse carinæ including the moderately raised apical margin, the basal carina low and sometimes hidden by the first segment, the third very high and separated from the apex by a broad depressed space; third segment depressed at the apex rather narrowly, the raised portion before the apex strongly bilobed; fourth and fifth segments narrowly transversely depressed on the apical margin. Pygidium elongate, vertical, the sides almost parallel, more than twice as long as broad, the sides raised into marginal carinæ at the base, a few fine longitudinal striæ at the base, rounded at the apex. Fifth ventral segment rather coarsely punctured. Intermediate tibiæ shallowly emarginate near the base beneath and produced at the apex of the emargination into a short stout spine directed towards the base; intermediate tarsi slender.

Testaceous brown; the head ferruginous brown; the apical depressed portions of the abdominal segments luteous.

Length 6 mm.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. January. "On *Leptospermum* bloom."

The head of the female is shaped as in *marginalis* Westw., but in that species there is no spine on the intermediate tibiæ and the first abdominal segment is much more narrowly depressed at the apex. In *trifidus* Westw. the head is much larger, but there is a similar spine on the intermediate tibiæ.

GLAPHYROTHYNNUS TRIFIDUS Westw.

Thynnus trifidus Westw. Arcana Ent. ii. p. 119 (1844), ♂.

♀. Head large, less than twice as broad anteriorly as long, rounded at the posterior angles, but not so strongly as in *sitiens* and *marginalis*, shining, very minutely punctured, with a distinct, longitudinal, frontal sulcus and a few large punctures round the base of the antennæ. Thorax shining, very minutely punctured; the pronotum twice as broad anteriorly as long, narrower than the head and narrowed a little posteriorly, the anterior and lateral margins with a few long greyish hairs. Scutellum transverse and short. Median segment distinctly longer than the scutellum, broadened from the base and very steeply sloped posteriorly. Abdomen with a few sparse punctures; the dorsal surface of the first segment divided transversely, the basal portion raised and distinctly longer than the strongly depressed apical portion; second segment with four transverse carinæ, including the recurved apical margin; segments 3–4 with a raised, curved mark on each side before the depressed apical margin. Pygidium vertical, very feebly recurved at the apex, elongate-ovate, twice as long as the greatest breadth, longitudinally striated on the basal half, narrowly subtruncate at the apex. Fifth ventral segment punctured-rugose. Intermediate tibiæ beneath with a spine directed towards the base, emarginate between the spine and the base.

Fuscous; the mandibles, antennæ, and legs testaceous brown; the sides and depressed portions of the abdominal segments pale luteous.

Length 9 mm.

Hab. Cottesloe, near Fremantle, W. A. (*H. M. Giles*). ♂ ♀ in cop. December.

"On *Eucalyptus* bloom."

GLAPHYROTHYNNUS CARINATUS Sm.

Thynnus carinatus Sm. Cat. Hym. B. M. vii. p. 29 (1859), ♂.

? *Zeleboria carinata* Sauss. Reise Novara, Zool. ii. Hym. p. 131 (1867), ♂ ♀.

I am very doubtful if Saussure's description can be intended for this species. Smith's type was from Western Australia, and specimens received from Mr. Giles and which I have compared with the type are mated with the female described below.

♀. Head not large, nearly twice as broad anteriorly as long, strongly rounded at the posterior angles, shining and very sparsely punctured, with a short frontal sulcus, the punctures round the base of the antennæ closer and piliferous. Thorax much narrower than the head; the pronotum less than twice as broad anteriorly as long and half as broad again anteriorly as posteriorly, the anterior and lateral margins with a sparse fringe of long hairs, finely and sparsely punctured. Median segment short, about the same length as the scutellum, strongly broadened from the base, the posterior truncation almost vertical. First dorsal abdominal segment divided into two almost equal parts, the apical portion strongly depressed and smooth, the basal portion raised and very sparsely punctured; second segment with four transverse carinæ, including the raised apical margin, the basal carina very low and often covered by the first segment, the third high and separated from the apical margin by a broad groove. Third and fourth segments with a raised curved mark on each side before the apex, the apical margin depressed, the raised portion punctured at the apex. Pygidium almost vertically truncate, long and narrow, about three times as long as the greatest breadth, a little broader towards the apex than at the base, rounded at the apex, the dorsal plate as long as the ventral, the basal portion with a median longitudinal carina and two lower carinæ converging at the base on each side. Fifth ventral segment coarsely punctured in the middle at the apex. There is an emargination and spine near the base of the intermediate tibiæ beneath as in *sitiens* and *trifidus*.

Pale luteous; head fusco-ferruginous; median segment, the apex of the raised portions of the first, third, and fourth dorsal abdominal segments, and the third carina on the second segment black.

Length 6–7 mm.

Hab. Claremont and Cottesloe, W. A. (*H. M. Giles*).

The colour is very variable, the black in some specimens being much more extensive.

Females from the east coast answer rather better to Saussure's description. The male is hardly distinguishable from the western specimens.

GLAPHYROTHYNNUS FUSIFORMIS Sauss.

Zeleboria fusiformis Sauss. Reise Novara, Zool. ii. Hym. p. 132 (1867), ♂.

I was evidently wrong in sinking this as a synonym of *carinatus*. Saussure's description agrees with male specimens sent by Mr. Giles, which closely resemble that species, but are paired with a female which is quite sufficiently distinct.

♀. Head rather large, nearly twice as broad anteriorly as long, rounded at the posterior angles, but not so strongly as in *carinatus*, very sparsely punctured, and finely shagreened. Thorax and median segment rather strongly punctured, shaped as in *carinatus*, but with longer and closer pubescence. Abdomen and pygidium as in *carinatus*, but the abdomen is broader, the punctures on the third, fourth, and fifth segments coarser and closer, the same segments being also sparsely clothed at the apex with long white hairs, and the raised marks not so strongly curved. The emargination on the intermediate tibiæ is less distinct, and the spine shorter and blunt.

Black; the antennæ, legs, and pygidium fusco-ferruginous; the sides of the abdomen and first and second segments at the apex pale luteous.

Length 7 mm.

Hab. South Perth, W. A. (*H. M. Giles*). November.

ASTHENOTHYNNUS DEDUCTOR, sp. n.

♂. Clypeus produced and very narrowly truncate at the apex, finely and closely punctured, with a carina from the base not quite reaching the apex, the apical margin narrowly depressed. Head finely and closely punctured, with a short, shining, longitudinal sulcus on the front; the interantennal prominence not much developed. Antennæ inserted nearer to each other than to the eyes, shorter than the thorax and median segment combined, rather stout throughout, the apical joints very feebly arcuate beneath. Thorax finely and closely punctured, more sparsely on the scutellum; pronotum narrowed anteriorly. Median segment longer than broad, rounded, minutely punctured. Abdomen slender, flattened, shorter than the head, thorax, and median segment combined, very delicately punctured, shining, broadened from the base; the first segment slender, with a deep sulcus from the base not reaching the apex. Hypopygium small, narrow, the sides parallel, subconical at the apex, without spines.

Black; the base of the mandibles, the inner orbits of the eyes very narrowly as high as the base of the antennæ, two very minute spots between the antennæ, the margins of the pronotum, and the postscutellum yellow; the apex of the clypeus, the tegulæ, the second and third abdominal segments, the apex of the first, and the legs, except the coxæ, bright ferruginous. Wings hyaline, slightly iridescent, nervures black, stigma pale ferruginous.

Length 6 mm.

Hab. Claremont, W. A. (*H. M. Giles*). December.

Nearest to *rubromaculatus* Turn.

ÆOLOTHYNNUS CRENULATUS, sp. n. (Plate XXXI. fig. 8, ♂.)

♂. Clypeus moderately convex, advanced and truncate at the apex, finely and shallowly punctured. Maxillary palpi rather stout, the basal joint short the apical lobe of the galea beyond the dividing-line large and rounded at the apex. Antennæ as long as the thorax without the median segment, of even thickness throughout, inserted a little nearer to each other than to the eyes. Head finely and closely punctured, no broader than the pronotum; the front and clypeus thinly clothed with long grey pubescence. Thorax rather closely punctured, sparsely on the scutellum, very closely on the mesopleuræ; pronotum only slightly narrowed anteriorly, the anterior margin slightly raised and almost straight; mesonotum less than twice as long as the pronotum; scutellum broadly truncate at the apex. Median segment finely and closely punctured, very short, steeply sloped posteriorly but not truncate, the sides clothed with white pubescence; an almost obsolete impressed longitudinal line from the base not reaching the middle. Abdomen longer than the head and thorax combined, the sides nearly parallel; segments strongly constricted at the base; the sixth ventral segment with a spine on each side at the apical angles; the dorsal segments closely punctured; the ventral segments punctured-rugose, finely longitudinally striated at the extreme base. Hypopygium broad, tridentate, the lateral spines very short, the apical spine much longer.

Black; the mandibles at the base, the apex of the clypeus, and two minute spots between the antennæ whitish yellow, a large quadrate spot on the mesonotum, the tegulæ and a curved line above them, a spot on the mesopleuræ below the anterior wings, a broad transverse band on the scutellum, and a small spot at each of the anterior angles, the postscutellum, a broad transverse band interrupted in the middle on each of the five basal dorsal abdominal segments, narrowest on the first, a spot on each side of the sixth segment, and the apical half of the anterior and intermediate femora beneath, yellow; tibiæ and tarsi fusco-ferruginous. Wings hyaline, nervures black, the stigma fusco-ferruginous.

The second cubital cell is much longer on the radial nervure than the third, and receives the first recurrent nervure beyond three-quarters from the base, the second recurrent nervure is received near the base of the third cubital cell.

Length 12 mm., exp. of wings 20 mm.

Hab. Hermannsburg, Central Australia (*H. J. Hillier*). April.

Belongs to the *cerceroides* group, but is not very near any described species.

ÆOLOTHYNNUS PERTURBATUS, sp. n.

♂. Clypeus slightly convex, advanced and rather broadly truncate at the apex, finely punctured, almost smooth in the middle. Antennæ rather short, of even thickness throughout. Head finely and closely punctured, thinly clothed with white pubescence, scarcely broader than the pronotum. Thorax finely and closely punctured, with sparse white pubescence; the pronotum very broadly and shallowly emarginate on the anterior margin, which is slightly raised; mesonotum nearly twice as long as the pronotum; scutellum shining and sparsely punctured. Median segment short, steeply sloped posteriorly, but not truncate, very closely and finely punctured. Abdomen elongate, as long as the head and thorax combined, the sides almost parallel from the base; the segments very strongly constricted at the base, shining and sparsely punctured. Sixth ventral segment with a spine on each side at the apical angles. Hypopygium ending in three long spines, the central spine the longest. Seventh dorsal segment coarsely punctured, the apical margin raised and slightly produced towards the middle. Second cubital cell twice as long as the third on the radial nervure; the second recurrent nervure received close to the base of the third cubital cell, almost interstitial with the second transverse cubital nervure.

Black; the mandibles at the base, the apical margin of the clypeus, a line on each side on the anterior margin of the pronotum, and the postscutellum pale creamy white; the two apical abdominal segments ferruginous red. Tegulæ creamy white at the base, testaceous at the apex. Wings hyaline, nervures black.

Length 9 mm.

Hab. Hermannsburg, Central Australia (*H. J. Hillier*).

Very near *sanguinolentus* Turn. from Liverpool, N.S.W., but the median segment in the present species is more rounded, not truncate, and is more finely punctured. The third cubital cell in *sanguinolentus* is fully as long as the second on the radial nervure. Also near *decipiens* Westw., but differs in the broadly emarginate pronotum, the shape of the clypeus, and the presence of whitish markings. The second recurrent nervure is more nearly interstitial than in either of the species mentioned.

TMESOTHYNNUS PLATYCEPHALUS, sp. n.

♂. Clypeus convex, punctured, produced and rather narrowly truncate at the apex. Head rather small, closely punctured-rugose; the interantennal prominence not well developed; a very delicate longitudinal frontal carina not reaching the anterior ocellus. Antennæ no longer than the thorax without the median segment, of nearly equal thickness throughout, the apical joints very feebly arcuate beneath. Thorax finely and closely punctured; the pronotum short, narrowed anteriorly, the anterior margin slightly raised; scutellum strongly convex. Median segment rounded, very finely and closely punctured, the extreme base smooth and shining. Abdomen as long as the head, thorax, and median segment combined, tapering a little at the extremities, the segments strongly constricted at the base, the apical margins narrowly depressed, punctured at the base, smooth and shining at the apex. Hypopygium short, projecting very little beyond the dorsal segment, with a long apical spine, a short spine on each side often concealed beneath the dorsal segment. Second abscissa of the radius longer than the third; second recurrent nervure received near the base of the third cubital cell.

Black; the mandibles, the apex of the clypeus, two minute spots between the antennæ, the posterior margin of the pronotum, the anterior angles of the pronotum, the tegulæ, and the postscutellum pale yellow. Tibiæ ferruginous brown. Wings hyaline, nervures black, the stigma ferruginous.

Length 9 mm.

♀. Head flattened, small, as long as the breadth anteriorly, narrowed posteriorly, coarsely punctured on the front, very sparsely on the vertex, without a frontal sulcus. Thorax narrower than the head, punctured; the pronotum a little broader than long, the sides nearly parallel and raised into marginal carinæ, with a longitudinal median carina; scutellum small, with a median carina. Median segment no longer than the scutellum, sharply broadened from the base and steeply sloped posteriorly, punctured and with sparse long pubescence. First dorsal abdominal segment divided into two portions, the basal portion raised and strongly emarginate posteriorly, sparsely punctured, the apical portion depressed and smooth; second segment with four transverse carinæ, including the raised apical margin, the two basal carinæ rather broadly separated from those at the apex; segments 3–5 rather coarsely punctured near the apex, the base finely aciculate, the apical margin narrowly depressed and smooth. Pygidium deflexed and broadened from the base; the dorsal plate rather narrowly ovate, with a low median carina and raised margins; the ventral plate projecting beyond the dorsal both on the sides and at the apex, rounded, with a narrow emargination at the apex. Fifth ventral segment finely punctured.

Black: the mandibles, antennæ, legs, and pygidium fuscous, the apex of the first dorsal abdominal segment, the space between the carinæ on the second and the extreme apical margin of the third whitish, in some specimens darker.

Length 5 7 mm.

Hab. South Perth, W. A. (*H. M. Giles*). 5♂, 5♀. January. "On *Leptospermum* bloom."

Nearest to *truncatus* Sm.

EPACTIOTHYNNUS CYGNORUM Turn.

Thynnus (*Æolothynnus*) *cygnorum* Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 141 (1908), ♂.

♂. Varies in size from 10 to 14 mm.

♀. Head slightly convex, broader than long, strongly rounded at the posterior angles, flattened on the vertex, sparsely punctured, the vertex and the front in the middle almost smooth, a longitudinal sulcus on the front; a small patch of white pubescence on each side about halfway between the eye and the posterior margin of the head. Pronotum nearly twice as broad anteriorly as long, narrowed a little posteriorly, closely punctured, margined anteriorly and laterally with long grey hairs, without a carina or tubercle. Median segment a little shorter than the scutellum, broadened from the base and obliquely truncate posteriorly, closely punctured and thinly covered with long grey pubescence. Abdomen smooth, with a few scattered punctures, the first segment with a deep transverse groove before the apex, the second segment with four strong transverse carinæ in addition to the raised apical margin. Fifth ventral segment coarsely punctured-rugose. Pygidium truncate posteriorly, very narrow, the surface of the truncation very narrowly elongate-ovate, about five times as long as the greatest breadth, the lateral margins raised.

Head and thorax dark ferruginous; median segment and abdomen black; a broad band on the first, third, and fourth dorsal segments and the sides of the second segment pale luteous; anterior and intermediate legs fusco-ferruginous.

Length 6–9 mm.

The colour varies much, some specimens being darker than the type.

Hab. Claremont, W. A. (*H. M. Giles*). December and January. "On *Eucalyptus* bloom. Common."

The absence of a carina on the pronotum is remarkable, separating the female from the nearly allied species. The head is somewhat compressed laterally behind the eyes.

EPACTIOTHYNNUS LABORIOSUS, sp. n.

♂ Clypeus convex, produced and rather broadly truncate at the apex. Head finely and very closely punctured; a very short longitudinal carina between the antennæ, which are inserted further from each other than from the eyes and are a little shorter than the thorax and median segment combined; the second joint of the flagellum scarcely more than half as long as the third. Pronotum nearly as broad as the head, slightly narrowed anteriorly, the anterior margin a little raised and straight, minutely punctured. Mesonotum and scutellum finely and very closely punctured; the scutellum rather narrowly truncate at the apex, with a well-marked longitudinal carina on the apical half. Median segment rounded, very finely punctured-rugulose. Abdomen a little longer than the head, thorax, and median segment combined, narrowed at the base, sparsely punctured; segments 2–5 strongly constricted at the base and depressed on the apical margin; the basal segment with a deep sulcus from the base nearly reaching the apex. Hypopygium with a short spine on each side near the base, thence narrowed sharply to the base of the acute apical spine. No spine on the sixth ventral segment.

Black; the abdomen, except the base of the first segment, the femora, tibiæ, and tarsi ferruginous red; tegulæ testaceous; base of the mandibles, apical margin of the clypeus, a spot on each side near the middle of the clypeus, the margins of the eyes narrowly as high as the base of the antennæ, and the posterior margin of the postscutellum pale yellowish. An obscure spot on each side of the vertex, near the summit of the eyes, dull ferruginous. Wings hyaline, faintly clouded near the apex, nervures black, stigma fusco-ferruginous.

Length 11 mm.

♀. Head rectangular, slightly rounded at the posterior angles, a little broader than long, sparsely but rather coarsely punctured, with a strong, longitudinal, frontal sulcus. Pronotum a little narrower than the head, broadly emarginate anteriorly, nearly half as broad again as long, with a well-marked median carina, depressed and slightly concave on each side of the carina, minutely punctured. Median segment as long as the scutellum, broadened from the base and obliquely truncate posteriorly, closely punctured. Abdomen much broader than the thorax, the first segment truncate at the base, with a transverse carina above the truncation, the dorsal surface very broadly depressed to the apex, with a raised curved mark on each side; the second segment with two or three transverse carinæ near the base, the apical margin very feebly raised; segments 3 and 4 broadly depressed at the apex, with a raised, curved, punctured mark on each side; fifth segment sparsely punctured. Ventral surface closely and rather coarsely punctured on the fifth segment as well as on the rest. Pygidium very narrow, deflexed and lanceolate, very narrowly rounded at the apex.

Fuscous; the apical margins of the abdominal segments broadly pale testaceous; the carinæ on the second segment and the pygidium fusco-ferruginous.

Length 6 mm.

Hab. Claremont, W. A. (*H. M. Giles*). ♂ ♀ in cop. December. "On *Eucalyptus* bloom."

Nearest to *excellens* Sm.

EPACTIOTHYNNUS DAHLI, sp. n.

♂. Clypeus advanced and not very narrowly truncate at the apex, coarsely but shallowly punctured, convex. Antennæ as long as the thorax and median segment combined, a little slenderer at the apex than at the base, the apical joints very feebly arcuate beneath; the third joint of the flagellum as long as the first and second combined; inserted a little further from each other than from the eyes, the interantennal carinæ oblique. Head very closely punctured, with short grey pubescence on the front, a little broader than the pronotum. Thorax very closely punctured, more sparsely on the pronotum. Median segment much shorter than the mesonotum, twice as broad as long, scarcely narrowed to the apex, more finely punctured than the mesonotum; a large, shallow, smooth depression on each side at the base. Abdomen shining, sparsely punctured, the sides almost parallel, tapering very slightly at the extremities; the first segment with a sulcus from the base to beyond the middle; segments 2–5 slightly constricted at the base; the seventh dorsal segment rugose, broad at the apex and with the apical margin raised to form a low carina. Ventral segments 2–5 subtuberculate at the apical angles, the sixth segment without a spine. Hypopygium with a spine on each side close to the base, thence rather narrowly triangular to the base of the acute apical spine. Second abscissa of the radius more than half as long again as the third, the first recurrent nervure received at three-quarters from the base of the second cubital cell, the second at one-fifth from the base of the third cubital cell.

Black; the clypeus, except a pyriform black mark on the middle, the base of the mandibles, two oblique lines between the antennæ, the margins of the pronotum, a spot on the mesonotum, the tegulæ, a broad curved band on the mesopleuræ beneath the anterior wings, a spot before the intermediate coxæ, a large spot on the scutellum and a smaller one at each of the anterior angles, the postscutellum, an irregular transverse band at the apex of the median segment, sometimes interrupted, a narrow transverse band on each side on dorsal segments 1–5, and a small spot at the base of the anterior tibiæ, yellow; a small spot close to the summit of each eye dark ferruginous red; the anterior and intermediate tibiæ and tarsi testaceous brown. Wings hyaline, nervures fuscous, the stigma ferruginous brown.

Length 12 mm.

♀. Head shining, sparsely punctured, more closely on the front than elsewhere, much broader anteriorly than long, strongly rounded posteriorly; the clypeus short and with a longitudinal carina. Pronotum narrower than the head, narrowed posteriorly, the anterior angles rather prominent (the dorsal surface destroyed by the pin); scutellum very narrow, longer than broad. Median segment punctured, shorter than the scutellum, broadened from the base and obliquely truncate posteriorly, the surface of the truncation shining, at the base finely punctured and pubescent. Abdomen shining, with a few scattered punctures, the first segment with the apical margin raised and a broad transverse groove before it; second segment with five strong transverse carinæ in addition to the raised apical margin. Pygidium sharply deflexed, long and narrow, nearly four times as long as the greatest breadth, broadest at the middle, narrowly rounded at the apex, a tuft of long golden hairs on each side. Fifth ventral segment very coarsely and closely punctured.

Fuscous; head and pygidium fusco-ferruginous, legs ferruginous brown; apical margin of the second dorsal segment of the abdomen pale testaceous.

Length 6 mm.

Hab. Ralum, New Britain (*Dahl*). ♂ ♀ in cop.

Types in the Berlin Museum. Described from three males and one female.

The male is very near *abductor* Sm. and *vagans* Sm., but the female differs from that of *vagans* in the shape of the head and in the number of carinæ on the second dorsal segment; in the latter character it also differs from *lævissimus* Sm., which is probably the female of *abductor*. The yellow band at the apex of the median segment of the male is absent in all specimens I have seen of *abductor*. The median segment is rather shorter and more rectangular than in either of the two species mentioned.

GYMNOTHYNNUS (?) LESŒUFI, sp. n.

♂. Clypeus strongly convex, produced and narrowly truncate at the apex. Head very closely and rather coarsely punctured; the antennæ about as long as the thorax without the median segment. Thorax finely and closely punctured; the pronotum narrower than the head, narrowed anteriorly; the scutellum rather broadly truncate at the apex. Median segment rounded, smooth and shining at the base, very finely punctured at the apex. Abdomen about as long as the head, thorax, and median segment combined, elongate fusiform, punctured, the segments strongly constricted at the base, the apical margin narrowly depressed. Sixth ventral segment without spines. Hypopygium broad, tridentate at the apex, the lateral spines short. Second cubital cell about equal in length to the third on the radial nervure, the first recurrent nervure received at about three-quarters from the base of the second cubital cell, the second received at one-fifth from the base of the third cubital cell.

Black; the mandibles at the base, the anterior margin of the clypeus, the margins of the pronotum, tegulæ, a narrow and obscure longitudinal line on the mesonotum, a broader one on the scutellum, and a transverse band on the postscutellum pale luteous yellow; anterior tibiæ and tarsi ferruginous. Wings hyaline, nervures black, the stigma pale ferruginous.

Length 8 mm.

♀. Head strongly compressed laterally, as thick as broad, the sides slightly concave at the posterior angles, broadened at the base of the mandibles, nearly twice as long as the greatest breadth, deflexed anteriorly, the front rather strongly punctured, with an obscure longitudinal sulcus, the vertex smooth. Pronotum broader than the head, almost rectangular, nearly half as long again as broad, quite flat and opaque; scutellum shining, small and narrow. Median segment shining and punctured, very narrow at the base, broadened and abruptly truncate posteriorly, a little longer than the scutellum. Abdomen much broader than the thorax, the segments very broadly depressed at the apex, punctured at the base, with a smooth rounded mark on each side before the depressed area. Pygidium long and narrow, deflexed, with long pubescence at the sides.

Black; the depressed apical portion of the abdominal segments shining and very pale lutaceous; pygidium fusco-ferruginous.

Length 4 mm.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. January. "On *Leptospermum* bloom."

The female is very distinct; the shape of the head is remarkable and also the absence of carinæ on the second abdominal segment. In the flattened pronotum it approaches *gilberti* Turn.

GYMNOTHYNNUS (?) TRIANGULICEPS, sp. n. (Plate XXXI. fig. 4, ♀.)

♀. Mandibles falcate, rather long and acute at the apex. Clypeus slightly produced, truncate at the apex, without a carina. Head very thin, slightly convex, as long as the breadth on the anterior margin, much narrowed posteriorly, subtriangular, narrowly truncate posteriorly, subopaque, with a few scattered punctures, an obscure longitudinal carina on the front, the lateral margins slightly raised. Pronotum rectangular, a little longer than broad, flat, subopaque, and without punctures, the lateral margins slightly raised, broader than the posterior margin of the head. Scutellum shining, very small; pleuræ finely aciculate. Median segment scarcely longer than the scutellum, broadened from the base and obliquely truncate posteriorly. Abdomen much broader than the thorax, the segments divided into two nearly equal parts transversely, the basal portion raised and broadly emarginate in the middle posteriorly, the apical portion strongly depressed, the sculpture of the second segment not differentiated. Pygidium long, elongate-ovate, convex, subcarinate longitudinally, not truncate or deflexed, with long grey hairs at the base.

Fuscous; the legs and mandibles fusco-ferruginous; pygidium testaceous; the depressed apical portions of the abdominal segments pale shining luteous.

Length 4 mm.

Hab. Cossack, W. A. (*J. J. Walker*).

Allied to *lesœufi* described above, but the shape of the head is very different.

HEMITHYNNUS PRÆSTABILIS, sp. n.

♂. Clypeus transversely rugulose, almost smooth at the apex, deeply triangularly emarginate, the angles of the emargination produced into short spines, a narrow and shallowly impressed line from the base not reaching the apex. Head finely and closely punctured, thickly clothed with long fulvous pubescence, which is longest between the antennæ and on the cheeks, with a shallow frontal sulcus which reaches the anterior ocellus. Antennæ a little shorter than the thorax and median segment combined, the apical joints tapering and slightly arcuate. Thorax finely and closely punctured, the anterior margin of the pronotum rather strongly raised, the angles not prominent; the pronotum and scutellum clothed with sparse and long fulvous hairs. Median segment more finely and shallowly punctured, the pubescence on the sides long and white. Abdomen slightly fusiform, shining, finely and very sparsely punctured; the apical dorsal segment narrowly truncate at the apex, with curved striæ; a thick tuft of long fulvous hairs below the dorsal segment and above the hypopygium, which is produced on each side near the base into a sharp angle, thence triangular, with the sides curved upwards to the base of the slightly recurved apical spine. Second abscissa of the radius a little longer than the third, the first recurrent nervure received at three-quarters from the base of the second cubital cell, the second at one-quarter from the base of the third cubital cell.

Black; the mandibles and the anterior margin of the clypeus yellow; the seventh abdominal segment and the sixth, except the extreme base, ferruginous red; tibiæ and tarsi light ferruginous. Wings hyaline, slightly tinged with yellow, nervures ferruginous at the base and apex and on the costa, fuscous in the middle.

Length 17 mm.

Hab. Western Australia (*Preiss*).

Type in Berlin Museum.

The emargination of the clypeus is unusual in Australian species.

HEMITHYNNUS PETULANS Sm. (Plate XXXI. figs. 5 ♂, 6 ♀.)

Thynnus petulans Sm. Descr. n. sp. Hym. p. 165 (1879), ♂.

♀. Clypeus very broadly and shallowly emarginate at the apex, with a short carina from the base not quite reaching the apex. Head moderately thick, slightly convex, half as broad again as long, rounded at the posterior angles, shining and sparsely punctured, the front between the antennæ coarsely punctured and divided by a delicate longitudinal sulcus. Thorax subopaque, closely and minutely punctured; the pronotum nearly twice as broad as long, with a row of deep setigerous punctures along the straight anterior margin. Median segment as long as the scutellum, broadened from the base and obliquely truncate posteriorly. A few large scattered punctures on the scutellum and median segment. Abdomen broad, nearly twice as long as the head and thorax combined, smooth, with a few scattered punctures; the first segment broad and short, not narrowed towards the base, with three or four low and fine transverse carinæ at the apex; second segment with about nine well-raised but more or less irregular transverse carinæ; fifth ventral segment longitudinally striated. Pygidium vertically deflexed posteriorly, the dorsal plate more than twice as long as broad, coarsely longitudinally striated at the base, smooth at the apex and very feebly trilobed.

Head and thorax ferruginous red; legs fusco-ferruginous; abdomen black, the first, third, fourth, and fifth dorsal segments with a broad yellow transverse band near the apex, the second dorsal segment with a large yellow spot on each side.

Length 11-16 mm.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. December and January.

"Resting on *Inula* shrub and *Eucalyptus* bloom. Not regular in its appearance, some years none are seen." (*Giles.*)

The female is nearly allied to those of *protervus* Sm. and *inconstans* Sm., but differs from the former in the colour of the head and thorax and in the shape of the first abdominal segment; from the latter species in the development of the carinæ on the two basal segments and in the rather narrower pygidium.

HEMITHYNNUS WALLISII Sm.

Thynnus wallisii Sm. Cat. Hym. B. M. vii. p. 14 (1859), ♂ ♀.

Specimens of this species in the Berlin Museum have the antennæ of the male ferruginous. The locality given for these specimens is New South Wales without any more precise information.

ONCORRHINUS XANTHOSPILUS Shuck. (Plate XXXI. fig. 7, ♀.)

Oncorrhinus xanthospilus Shuck., Grey's Journal of two Expeditions to N.W. and W. Australia, ii. p. 471 (1841), ♂.

♀. Mandibles simple, not bidentate; clypeus truncate at the apex, finely punctured, without a carina. Head slightly convex, nearly twice as broad as long, with a short, longitudinal, frontal sulcus; smooth, with deep sparse punctures above the base of the antennæ and on the vertex. Antennæ shorter than the breadth of the head; the joints of the flagellum broader than long. Posterior angles of the head rounded. Thorax sparsely punctured; the pronotum narrower than the head, twice as broad as long, very slightly narrowed posteriorly; scutellum much broader than long. Median segment very short, obliquely truncate a little behind the scutellum, the surface of the truncation finely shagreened. Abdomen broader than the thorax; very shallowly and sparsely punctured; the basal segment concavo-truncate anteriorly, very narrowly depressed on the apical margin; second segment irregularly and finely transversely carinated, with a strong transverse carina near the apex separated by a broad groove from the strongly raised apical margin. Pygidium not contracted at the base, vertically truncate posteriorly, the surface of the truncation broadly ovate and longitudinally striated, the striæ strong and arched at the base. Fifth ventral segment coarsely longitudinally striated. Intermediate tibiæ moderately thickened; the first joint of the intermediate tarsi normal, not thickened; tarsal ungues bidentate, small.

Fusco-ferruginous, the legs and pygidium paler; head black; the sides of the abdominal segments pale testaceous.

Length 12 mm.

Hab. South Perth, Guildford, W. A. (*H. M. Giles*). ♂ ♀ in cop. "On *Eucalyptus* bloom. Fairly common." (*Giles.*)

The disparity between the sexes is great and the female is not so aberrant as the male, showing close relationship to other species allied to the *Macrothynnus* group. The palpi are minute as in *Thynnus*, the maxillary palpi two-jointed, the labial palpi three-jointed.

MACROTHYNNUS SIMILLIMUS Sm.

Thynnus simillimus Sm. Cat. Hym. B. M. vii. p. 15 (1859), ♂.

A male specimen sent by Mr. Giles differs from the typical form from New South Wales in the somewhat less robust form, the presence of a low longitudinal carina on the scutellum, and the more triangular shape of the hypopygium.

Hab. South Perth, W. A.

THYNNOIDES PREISSII, sp. n.

Thynnus preissii Klug, MS.

♂. Clypeus rounded at the apex, shallowly and rather sparsely punctured, prominent at the base. Antennæ as long as the thorax and median segment combined, inserted much further from each other than from the eyes, of almost equal thickness throughout; the interantennal prominence very broadly rounded at the apex, divided by a short longitudinal carina. Head and thorax closely and finely punctured, the front more coarsely, the scutellum more sparsely; the anterior margin of the pronotum almost straight, very slightly emarginate, strongly raised, with a deep groove behind it, the angles rather prominent; scutellum broadly truncate at the apex. Median segment very delicately punctured-rugulose, obliquely depressed from the postscutellum, rounded at the sides. Abdomen elongate, much longer than the head, thorax, and median segment combined, the segments very slightly constricted at the base; the first segment with a sulcus from the base nearly reaching the apex, very finely and closely punctured; the apical segment more coarsely punctured, subtruncate at the apex, with a few indistinct transverse striæ. Sixth ventral segment without spines. Hypopygium with a blunt spine on each side at the base, thence produced in a very narrow triangular shape to the base of the apical spine. First ventral segment not carinate. Second abcissa of the radius quite as long as the third; second recurrent nervure received at one-third from the base of the third cubital cell.

Black; the mandibles, except at the apex, and the clypeus yellow; a transverse mark near the apex of the clypeus brown. Wings fusco-hyaline, nervures black.

Length 18 mm.

Hab. Western Australia (*Preiss*).

Type in Berlin Museum.

Easily distinguished by the rounded margin of the clypeus.

THYNNOIDES RUFITHORAX, sp. n.

♀. Clypeus small, transverse, punctured, without a carina. Head shining, sparsely punctured, more closely on the front than on the vertex, rather longer than its greatest breadth, much narrowed posteriorly, very slightly convex, with a short blunt spine on each side near the middle of the lateral margin. Thorax shining, obsoletely punctured; the pronotum nearly as broad as the broadest part of the head, twice as broad as long, the anterior margin arched, with a row of setigerous punctures behind it, slightly narrowed posteriorly. Pleuræ shining and almost smooth. Median segment closely punctured, very short, shorter than the scutellum, obliquely truncate posteriorly, the surface of the truncation finely aciculate. Abdomen much broader than the thorax, the segments smooth at the base, finely punctured at the apex; the first segment truncate anteriorly, the dorsal surface divided into two equal portions by a transverse carina, the basal half sparsely punctured, the apical half depressed and finely aciculated; second segment with three transverse carinæ at the base, followed by two more broadly interrupted in the middle, then broadly depressed to the apex, the apical margin raised. Pygidium almost vertical, long and narrow, longitudinally striated near the base, compressed near the middle and smooth at the apex. Fifth ventral segment coarsely rugose.

Black; the mandibles at the base, the apex of the scape, thorax, median segment, and legs ferruginous red; the apex of the pygidium testaceous; flagellum fuscous.

Length 9 mm.

Hab. Ararat, Victoria.

Type in the Berlin Museum.

THYNNOIDES NEPHELOPTERUS, sp. n.

♂. Clypeus large, produced and very broadly subemarginate at the apex, rather sparsely punctured, some of the punctures confluent longitudinally; the labrum projecting and very shallowly emarginate at the apex. Head very closely and finely punctured, the front punctured-rugose; the interantennal prominence very broadly rounded at the apex, connected by a short carina with the base of the clypeus, divided by a short, fine, longitudinal carina. Antennæ inserted a little further from each other than from the eyes, as long as the thorax without the median segment, very slightly slenderer at the apex than in the middle. Thorax finely and closely punctured, more sparsely on the scutellum; pronotum with the anterior margin a little raised, the anterior angles somewhat prominent; scutellum very broadly rounded at the apex. Median segment rounded at the sides, obliquely depressed from near the base, very finely punctured rugulose. Anterior coxæ strongly concave beneath. Abdomen fusiform; segments 2-5 slightly constricted at the base, the segments very finely and closely punctured at the base, a little more strongly and sparsely at the apex; seventh dorsal segment rugulose, rounded at the apex, without a flattened plate; sixth ventral segment without spines. Hypopygium with a prominent tooth on each side at the basal angles, thence elongate-triangular to the base of the apical spine, with a few transverse striæ on the dorsal surface. The groove between the two basal segments is deep, the second segment is without a tubercle at the base.

Black; the mandibles (except at the apex) and the clypeus (except a fuscous spot on each side near the apex) orange-yellow; wings fusco-hyaline, nervures black.

The second recurrent nervure is received just beyond one-quarter from the base of the third cubital cell.

Length 13-19 mm.

♀. Clypeus without a carina; mandibles falcate. Head strongly convex, nearly as long as the breadth on the anterior margin, much narrowed posteriorly, shining, with a few small scattered punctures and a longitudinal frontal sulcus; the posterior margin shallowly emarginate. Pronotum shining, with a few small punctures, a little broader than long, the sides almost parallel, the anterior margin feebly rounded in the middle. Median segment less than half as long as the pronotum, broadened from the base, the apical angles subtuberculate, obliquely truncate posteriorly, and very minutely punctured. Abdomen microscopically punctured, with a few large scattered punctures; the basal segment with a transverse carina before the apex, separated by a deep and broad groove from the raised apical margin; second segment with five even and strong transverse carinæ, including the raised apical margin; fifth ventral segment coarsely longitudinally striated. Pygidium deflexed, long, exceedingly narrow, almost linear, slightly expanding at the apex, which is very narrowly rounded; the dorsal plate much shorter than the ventral and very feebly and narrowly trilobed at the apex. Anterior coxæ not concave; intermediate tibiæ scarcely broader than the posterior; basal joint of intermediate tarsi normal, not flattened.

Black; the mandibles at the base, the second dorsal abdominal segment, and the spines of tibiæ and tarsi fusco-ferruginous.

Length 8-10 mm.

Hab. South Perth, W. A. (*H. M. Giles*). December.

"On *Leptospermum*, occasionally on *Eucalyptus*. Plentiful every season." (*Giles*.)

THYNNOIDES LANIO, sp. n.

♂. *Clypeus large, broad and subemarginate at the apex, sparsely punctured; the extreme apex of the labrum only visible; outer margin of the maxillæ fringed with long hairs.* Head finely and very closely punctured; the interantennal prominence *pointed at the apex and connected by a short and broad carina* with the base of the clypeus. Antennæ as long as the thorax without the median segment, tapering very slightly towards the apex. Thorax and median segment finely and closely punctured, most sparsely on the scutellum, most closely and finely on the median segment; the pronotum narrowed anteriorly, the anterior margin slightly raised; median segment short, rounded at the sides, obliquely sloped from just behind the postscutellum. Abdomen elongate fusiform, the segments feebly constricted at *the base, rather closely and not very finely punctured; the basal segment oblique from near the apex to the base, divided by a median sulcus which nearly reaches the apex; the apical dorsal segment deflexed and strongly punctured; the groove between the two basal ventral segments broad but rather shallow*, the sixth ventral segment without spines. Hypopygium with a tooth on each side at the basal angles, thence triangular to the base of the acute apical spine. Anterior coxæ not concave.

Black, with sparse grey pubescence, long and close on the median segment; the clypeus, mandibles (except the apical teeth), the margins of the eyes interrupted on the summit, a short oblique line on each side between the antennæ, a narrow transverse band broadly interrupted in the middle on the pronotum, and two spots on the tegulæ, yellow; a short transverse band broadly interrupted in the middle on dorsal segments 2–5 ferruginous brown, tinged with yellow on the second and third, very obscure on the fifth segment; the base of ventral segments 2–5 narrowly fusco ferruginous. Wings hyaline washed with fuscous, nervures black. Anterior tibiæ beneath fusco-ferruginous.

Length 20 mm.

♀. Clypeus without a carina. Head nearly rectangular, slightly rounded at the posterior angles, a little convex, broader than long by about one-quarter, smooth and shining, with a short, longitudinal frontal sulcus. Pronotum more than half as broad again anteriorly as long, a little narrowed posteriorly, very sparsely and finely punctured, with larger setigerous punctures on the anterior and lateral margins, the anterior margin very broadly and shallowly emarginate, the anterior angles prominent and subtuberculate. Scutellum and median segment sparsely punctured; the scutellum not very narrow; the median segment a little shorter than the scutellum, broadened from the base and almost vertically truncate posteriorly. *First abdominal segment truncate anteriorly, the dorsal surface divided into two almost equal parts by a transverse carina; the basal portion coarsely but rather* sparsely punctured, the apical portion depressed and almost without punctures, the apical margin slightly raised; second segment with five strongly raised transverse carinæ including the raised apical margin; segments 3–5 smooth at the base, coarsely but sparsely punctured at the apex; fifth ventral segment coarsely longitudinally striated. Pygidium sharply deflexed, long and almost linear, slightly broadened at the apex into a narrow, elongate-ovate surface; both the dorsal and ventral plates very narrowly rounded at the apex; a tuft of golden hairs on each side near the base.

Black; the thorax and *median segment ferruginous red; the mandibles at the base, the apex of the scape, and the anterior* tibiæ and *tarsi beneath ferruginous.*

Length 11 mm.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. February.

"*Eucalyptus* bloom. Rare, only one pair seen." (*Giles.*)

This is not very close to typical *Thynnoides*, the male being without the concave coxæ. It is perhaps nearer to the *melleus* group.

CAMPYLOTHYNNUS ASSIMILIS Sm.

Thynnus assimilis Sm. Cat. Hym. B. M. vii. p. 20 (1859), ♂.

Thynnus flavofasciatus Sm. Cat. Hym. B. M. vii. p. 45 (1859), ♀.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop.

This species is most nearly allied to *T. flavopictus* Sm.

Elidothynnus agilis Sm.

Thynnus agilis Sm. Cat. Hym. B. M. vii. p. 20 (1859), ♂.

♀. Clypeus without a carina; mandibles rather flattened, with a very small tubercle near the middle of the inner margin. Front sparsely but coarsely punctured and very sparsely clothed with greyish hairs, vertex shining, very sparsely and finely punctured; the head broader than long, rounded at the posterior angles. A short and obscure longitudinal sulcus between the antennæ; the scape smooth above, punctured beneath, with a few long grey hairs. Pronotum half as broad again anteriorly as long, narrowed a little posteriorly, sparsely punctured, with a row of punctures along the anterior margin, all the punctures piliferous. Median segment sparsely punctured, half as long as the pronotum, broadened from the base, obliquely truncate posteriorly, the surface of the truncation almost smooth. Abdomen very sparsely punctured, the segments smooth at the base and apex, the sides and apex of the abdomen thinly clothed with long grey pubescence; the basal segment with a transverse carina strongly émarginate posteriorly before the apex, the apical margin broadly depressed; second segment with four transverse carinæ on the basal portion, the space between the raised apical margin and the carinæ finely transversely striated; fifth ventral segment longitudinally striated. Pygidium long and very narrow; the basal portion long and strongly compressed, bearing two or three longitudinal carinæ; deflexed obliquely posteriorly and broadened, the surface narrowly elongate-ovate; the dorsal plate with a median carina not reaching the apex which is trilobed; the ventral plate narrower than the dorsal and rounded at the apex. Intermediate tibiæ no thicker than the posterior, basal joint of the intermediate tarsi normal.

Black; the head and legs ferruginous; the middle of the ventral abdominal segments and the pygidium fusco-ferruginous; a tuft of long golden hairs on each side of the pygidium.

Length 12–14 mm.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. January and February.

"*Eucalyptus* bloom. Rare." (*Giles.*)

Elidothynnus mobilis, sp. n.

♂. Clypeus sparsely punctured, rather broadly truncate at the apex. Head, pronotum, mesonotum, and median segment finely and closely punctured, scutellum and abdomen more sparsely and strongly punctured. Interantennal prominence V-shaped; the antennæ stout, of even thickness throughout, as long as the thorax and median segment combined. Median segment obliquely depressed from the postscutellum, rounded at the sides. Abdomen elongate, tapering slightly at the extremities. Seventh dorsal segment deflexed, coarsely punctured and truncate at the apex, without a flattened plate. Hypopygium short, only projecting a little beyond the dorsal segment, produced into lateral angles near the base but not toothed, thence triangular to the base of the short apical spine.

Black; the clypeus, the orbits of the eyes narrowly, broadly interrupted at the summit, the apex of the interantennal prominence, a broad arched band on the pronotum, a quadrate spot on the mesonotum, another on the scutellum, a transverse band on the postscutellum, a spot on the mesopleuræ below the anterior wings, the tegulæ, a large spot on each side of the six basal dorsal segments of the abdomen and on each side of ventral segments 2-5, yellow; femora, tibiæ, and tarsi ferruginous. Wings hyaline, tinged with yellow, nervures fuscous.

Length 17 mm.

♀. Clypeus without a carina; the mandibles broad and rather stout. Head half as broad again anteriorly as long, strongly rounded at the posterior angles, very slightly convex, thin, shining, very sparsely and finely punctured both on the vertex and front; a well-marked longitudinal sulcus on the front. Thorax rather closely punctured, the pronotum much more finely than the median segment; the pronotum nearly twice as broad as long, the sides almost parallel, with a row of long grey hairs on the anterior margin. Median segment no longer than the scutellum, broadened from the base and obliquely truncate posteriorly, the surface of the truncation shining, with a few scattered punctures. Abdominal segments smooth at the base; the first segment truncate anteriorly, with a row of setigerous punctures above the base of the truncation, the apical margin broadly depressed, leaving a raised mark strongly emarginate in the middle and rounded at the sides before the depression; second segment with three transverse carinæ near the base, the space between the raised apical margin and the carinæ indistinctly transversely striated; third segment depressed at the apex as in the first segment, the raised mark before the depression very sparsely punctured near the apex; fourth and fifth segments closely punctured at the apex; fifth ventral segment longitudinally and coarsely striated. Pygidium deflexed, very long and narrow, almost vertically truncate posteriorly, compressed and linear before the truncation, the surface of the truncation very narrowly elongate-ovate; the dorsal plate trilobed at the apex; the ventral plate extending beyond the dorsal and narrowly rounded at the apex.

Black; the mandibles at the base, clypeus, scape, vertex, pygidium, the middle of the second dorsal segment, the depressed apical margin of the first and third segments, and the extreme apex of the fourth and fifth fusco-ferruginous; legs and the whole ventral surface light testaceous brown. A tuft of golden hairs on each side of the pygidium. Basal joint of intermediate tarsi not broadened.

Length 12 mm.

Hab. Guildford, W. A. (*H. M. Giles*). ♂ ♀ in cop. December. "On *Leptospermum* bloom. Scarce." (*Giles.*)

Allied to *melleus* Westw. and also to *insidiator* Sm. and *agilis* Sm., from the last of which the male is hardly distinguishable by any constant character, though the size is different. But the female has the head somewhat broader than in *agilis*, the pygidium narrower, and the sculpture different. In the male the yellow marks on the abdomen are less extensive than in *agilis*, the spot on the mesonotum is more developed, being often entirely absent in *agilis*, and the angles at the base of the hypopygium are somewhat less prominent in the present species.

ELIDOTHYNNUS BASALIS Sm.

Thynnus basalis Sm. Cat. Hym. B. M. vii. p. 23 (1859), ♂.

A long series of this species and of *T. tuberculifrons* Sm. sent by Mr. Giles, who states that they are two of the commonest species in the neighbourhood of Perth and that the females seem to him to be identical. The females sent are similar to that previously described by me from a damaged specimen as the female of *T. tuberculifrons* Sm., but the low carina on the pronotum is absent. I am therefore driven to the conclusion that the specimens with the red abdomen (*basalis*) and those with the black abdomen (*tuberculifrons*) are two forms of the same species distinct from *vastator* Sm., though intermediate colour-varieties do not seem to occur. One specimen, apparently identical with *basalis*, is, however, paired with a female closely resembling that described by Smith as *vastator*, though differing in the presence of four raised carinæ instead of three at the base of the second dorsal segment. I have dissected out the genitalia of *basalis* and *tuberculifrons*, and can find absolutely no difference.

LESTRICOTHYNNUS CONSTRICTUS Sm.

Thynnus constrictus Sm. Cat. Hym. B. M. vii. p. 19 (1859), ♂.

♀. Clypeus with an obscure carina at the base, the anterior margin feebly and very broadly rounded; mandibles stout and rather short. Head moderately convex, rather large, nearly as long as broad, rounded at the posterior angles, shining, very sparsely and shallowly punctured, with a short, longitudinal, frontal sulcus; three large punctures in a triangle on the vertex. Thorax very finely and sparsely punctured, a row of deeper punctures each bearing a seta along the anterior margin of the pronotum, which is narrower than the head, nearly rectangular and almost twice as broad as long. Median segment a little longer than the scutellum, broadened from the base and abruptly truncate posteriorly, deeply and rather closely punctured, the surface of the truncation almost smooth. Abdomen very sparsely and finely punctured, the first segment with the apical margin raised and a deep transverse groove before it; the second segment with about eight transverse carinæ including the raised apical margin, the six basal carinæ low and more or less irregular, the two apical carinæ higher and regular; fifth segment more closely punctured.

Ventral surface more closely and coarsely punctured, the fifth segment coarsely longitudinally striated. Pygidium long and very narrow, linear at the base; sharply deflexed posteriorly and very narrowly elongate-ovate, with a short but strong longitudinal carina at the base. Basal joint of intermediate tarsi normal.

Ferruginous brown; the apex of the mandibles, median segment, the apical half of the third dorsal abdominal segment, and the whole of the fourth, fifth, and sixth segments black.

Length 13 mm.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. "On *Leptospermum* bloom."

A male of this species was sent by Mr. Giles paired with a female of *C. assimilis* Sm. taken on *Eucalyptus ficifolia*. He states that cross-pairing is occasionally met with in the Thynnidæ.

LESTRICOTHYNNUS OPTIMUS Sm.

Thynnus optimus Sm. Cat. Hym. B. M. vii. p. 29. n. 74 (1859), ♂.

Thynnus (*Aeolothynnus*) *optimus* Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 125 (1908), ♂.

This should probably be placed in the section of the genus near *nubilipennis* Sm., though differing in the more flattened abdomen, the shape of the hypopygium, and in the position of the second recurrent nervure, which is strongly curved and received very near the base of the third cubital cell. Except in the latter character it is very near *L. illidgei* described below. *L. sulcatus* Sm. is most probably the female of this species, being allied to the female of *L. illidgei*, but the very fragmentary condition of the type renders close comparison in some points impossible.

LESTRICOTHYNNUS ILLIDGEI, sp. n.

♂. Clypeus convex in the middle, produced and rather broadly truncate on the apical margin, very finely and sparsely punctured, with a slightly depressed mark on each side before the apex, pointed at the base and connected with the interantennal prominence by a short carina; the labrum projecting slightly beyond the clypeus and broadly rounded at the apex. Palpi slender, but not elongate; the basal joint of the labial palpi about as long as the second and third combined. Antennæ longer than the thorax and median segment combined, the apical joints very feebly arcuate and a little slenderer than the others; the distance between the antennæ at the base rather less than that between the base of the antennæ and the eyes. Head small, opaque and closely punctured, broader than the pronotum; the interantennal prominence V-shaped. Pronotum shining and almost smooth, the anterior margin very slightly raised; mesonotum closely punctured, less closely so on the disc than on the sides, with the usual two longitudinal sulci on each side. Scutellum and median segment shining, shallowly and rather sparsely punctured; the scutellum convex and rather broadly truncate at the apex; median segment rounded a little longer than broad. Abdomen elongate, the sides nearly parallel, the segments not strongly convex above; segments 2–4 marked with a depressed transverse line close to the base, but not appreciably constricted; the segments closely and rather shallowly punctured; the basal segment longer than the breadth at the apex, with a longitudinal sulcus from the base to beyond the middle. Seventh dorsal segment narrow, much longer than broad and very narrowly rounded at the apex, the apical half rugose. Hypopygium small, without basal spines, ending in a spine which alone projects beyond the dorsal segment and is sometimes feebly recurved. Second recurrent nervure received by the third cubital cell just before one-third from the base.

Black; the mandibles (except at the apex), clypeus, the margins of the eyes very broadly, narrowing on the inner margin and not quite reaching the summit, the band on the outer margin more narrowly continued and undulating on the posterior margin of the head, the interantennal prominence, the margins of the pronotum, the pleuræ, coxæ beneath, tegulæ and a line above them, a spot bifurcate anteriorly on the disc of the mesonotum, scutellum, postscutellum, an oblique band curved at the apex on each side of the median segment and a broad transverse band, broadly interrupted in the middle, on both dorsal and ventral segments 1–6 of the abdomen, represented on the first ventral segment by a triangular spot, yellow; the seventh segment and the femora, tibiæ, and tarsi dull ferruginous. Wings hyaline, with a small fuscous cloud at the apex of the radial cell; nervures fuscous, the stigma fusco-ferruginous.

Length 14-15 mm.

♀. Mandibles rather broad and flattened, pointed at the apex; the clypeus small, without a carina. Head half as broad again as long, rounded at the posterior angles, smooth and shining, with a longitudinal frontal sulcus and a large shallow depression on each side reaching more than halfway from the base of the antennæ to the vertex. Thorax and median segment closely and rather finely punctured; the pronotum twice as broad as long, nearly as broad as the head, the sides nearly parallel; scutellum not very narrow, rounded at the apex; median segment very short, obliquely truncate posteriorly. Abdomen broader than the thorax; the first segment with a broad, shallow, transverse groove close to the apex, the second segment with four strong transverse carinæ and the apical margin raised; the first, third, fourth, and fifth segments closely and finely punctured and covered with short greyish pubescence. Pygidium truncate posteriorly, narrow at the base but not contracted at the base of the truncation, the surface of the truncation elongate-ovate with three longitudinal carinæ at the base, the apex smooth and shining; the hypopygium extending far beyond the epipygium. Fifth ventral segment rugose.

Black; the flagellum, the tibiæ and tarsi, the dorsal surface of the first abdominal segment, the sides of the other segments, and a transverse band near the base of segments 3–5 obscure creamy yellow. The colour is very variable.

Length 8–9 mm.

Hab. Mooraree, near Brisbane, Q. (*R. Illidge*).

On *Leptospermum* blossom. 5 pairs in cop.

Near *L. optimus* Sm. from Western Australia, and related, though less nearly, to *L. nubilipennis* Sm. The female is related to *L. sulcatus* Sm., but the depressions on the head are much smaller and shallower than in that species.

LESTRICOTHYNNUS SUBTILIS, sp. n.

♂. Clypeus strongly convex, broadly truncate at the apex, very coarsely punctured, with a low carina from the base to the apex. Head punctured-rugose, the interantennal prominence very broadly truncate at the apex; antennæ inserted further from each other than from the eyes, as long as the thorax and median segment combined and of nearly even thickness throughout. Thorax and median segment very finely and closely punctured, most finely on the pronotum and median segment; the pronotum narrower than the head, the anterior margin very slightly raised, the posterior margin almost smooth; median segment rounded. Abdomen elongate, rather slender, tapering a little at the extremities, the segments not constricted, very closely and finely punctured, the sixth ventral segment without spines; dorsal plate of the seventh segment flattened, triangular, and longitudinally striated. Hypopygium short, scarcely projecting beyond the dorsal segment, broadly triangular, with a short apical spine. Second abscissa of the radius longer than the third; second recurrent nervure received near the base of the third cubital cell.

Black, with short white pubescence on the sides of the thorax and abdomen. Wings pale fusco-hyaline, nervures fuscous.

Length 19 mm.

♀. Clypeus without a carina, smooth and shining. Head closely microscopically punctured, twice as broad as long, rounded at the posterior angles, with a delicate, longitudinal, frontal sulcus. Pronotum rectangular, more than half as broad again as long, narrower than the head, finely and sparsely punctured, with a few setigerous punctures on the anterior margin; scutellum transverse, about three times as broad as long; median segment obliquely truncate from just behind the scutellum, very minutely punctured. Abdomen sparsely and shallowly punctured; the second segment with a low transverse carina at the base and two higher carinæ, rather widely separated from each other, at the apex, one being formed by the raised apical margin, the space between them and the basal carina with about four low, ill-defined, undulating and broken carinæ. Fifth ventral segment coarsely longitudinally striated. Pygidium vertically truncate posteriorly, the face of the truncation rather narrowly ovate and coarsely longitudinally striated; the ventral plate extending a little beyond the dorsal, without any constriction at the base. First joint of the intermediate tarsi slender; tarsal ungues small, bidentate.

Entirely castaneous brown, varying in darkness according to the age of the specimen.

Length 10–11 mm.

Hab. Claremont, W. A. (*H. M. Giles*). ♂ ♀ in cop. December. 2 ♂. 2 ♀.

Allied to *L. vigilans* Sm.

LESTRICOTHYNNUS (?) TENUATUS Sm.

Thynnus (*Agriomyia*) *tenuatus* Sm. Cat. Hym. B. M. vii. p. 31 (1859), ♂.

Thynnus (*Lophocheilus*) *tenuatus* Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 173 (1908), ♂.

♀. Clypeus without a carina. Head subopaque, very minutely and closely punctured, the cheeks and vertex shining and almost smooth, with a short and obscure longitudinal frontal sulcus, more than half as broad again anteriorly as long, the posterior angles strongly rounded. Pronotum sparsely punctured, with a row of large setigerous punctures on the anterior margin, broader than long and slightly narrowed posteriorly. Scutellum sparsely punctured. Median segment shorter than the scutellum, very minutely and closely punctured, broadened from the base and steeply sloped posteriorly. First abdominal segment concavo-truncate anteriorly, the dorsal surface shining and sparsely punctured, the apical margin raised slightly, with a narrow groove before it; second segment with about eight more or less irregular transverse carinæ, including the raised apical margin, the carinæ at the base much lower than those at the apex; segments 3–5 finely and rather closely punctured, delicately aciculate at the base, narrowly smooth at the apex; fifth ventral segment coarsely longitudinally striated. Pygidium not very narrow at the base, vertically truncate posteriorly, with arched carinæ above the base of the truncation, the surface of the truncation ovate, narrowly truncate at the apex, and with four strongly raised arched carinæ on the basal half. The intermediate tibiæ are thickened and spinose, but the basal joint of the intermediate tarsi is not unusually broad.

Fusco-ferruginous, the second, fourth, fifth, and apical segments of the abdomen almost black.

Length 11 mm.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. November.

"On *Leptospermum* bloom. Very rare." (*Giles.*)

The female seems more nearly allied to *crudelis* Turn. than to any other, although the male is without spines on the sixth ventral segment. It does not seem to be well placed either in the *Agriomyia* or *Lophocheilus* groups.

TACHYNOTHYNNUS PICIPES Westw.

Thynnus picipes Westw. Arc. Ent. ii. p. 114 (1844), ♂.

Specimens of the male sent by Mr. Giles have the legs black and the wings rather darker than in the typical form. One specimen has the apex of the first abdominal segment dull ferruginous.

♀. Mandibles stout, acute at the apex, with a small tooth near the middle of the inner margin. Clypeus without a carina. Head coarsely punctured on the front, the punctures piliferous, smooth and shining on the vertex, nearly half as broad again as long, the posterior angles rounded, slightly narrowed anteriorly, scarcely convex. Pronotum nearly as broad as the head, more than half as broad again as long anteriorly, a little narrowed posteriorly, the anterior margin not quite straight, very shallowly emarginate, sparsely punctured on the sides, smooth in the middle, a row of large setigerous punctures along the anterior margin. Scutellum and median segment sparsely punctured, the median segment as long as the scutellum, broadened from the base and almost vertically truncate posteriorly. First dorsal segment of the abdomen coarsely punctured-rugulose, the apical margin a little raised, with a broad groove before it; second segment with about eight transverse carinæ including the raised apical margin, those near the base lower, the apical margin with a very broad groove before it; segments 3–5 shining, sparsely punctured at the apex. Pygidium obliquely deflexed, narrow at the base, gradually broadened to the apex, elongate-triangular, with strong transverse carinæ, slightly arched; the ventral plate rounded at the apex and expanding on each side of the dorsal. A tuft of hairs on each side springing from below the apex of the fifth segment. Fifth ventral segment rugose, with oblique curved striæ at the apex. Intermediate tibiæ thick and spinose, basal joint of intermediate tarsi not flattened.

Black; head, middle of the pronotum, second abdominal segment, and the spines of the tibiæ and tarsi fusco-ferruginous.

Length 14 mm.

Hab. Cottesloe, near Fremantle, W. A. (*H. M. Giles*). ♂ ♀ in cop. December.

"On *Eucalyptus* bloom."

The female, as would be expected, is near the *shuckardi* group.

POGONOTHYNNUS (?) WALKERI Turn.

Thynnus walkeri Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 236 (1908), ♂.

♀. Clypeus without a carina. Head finely and sparsely punctured, shining, with a short, longitudinal, frontal sulcus, slightly convex, half as broad again as long. Pronotum as broad as the head, nearly twice as broad as long, the sides almost parallel, smooth and shining, with a few minute scattered punctures and a row of deeper setigerous punctures along the straight anterior margin. Scutellum very sparsely punctured, slightly depressed on the middle of the apical margin; median segment more closely and coarsely punctured, less than half as long as the scutellum, steeply sloped and almost smooth posteriorly. First abdominal segment concavo-truncate anteriorly, the dorsal surface with two well-marked transverse carinæ at the apex and two or three ill-defined transverse striæ before them; second segment with six strong transverse carinæ including the raised apical margin; segments 3-5 smooth at the base, very sparsely punctured near the apex; fifth ventral segment coarsely obliquely striated. Pygidium deflexed from the base and smooth, truncate posteriorly, the surface of the truncation twice as long as broad, the sides nearly parallel, the apical margin deeply and broadly emarginate; the dorsal plate reaching beyond the ventral, smooth and opaque, with a short transverse carina close to the base; the pygidium narrow and subconcavely depressed just before the base of the truncation.

Ferruginous brown, the abdomen fuscous or fusco-ferruginous.

Intermediate tibiæ broad and swollen, basal joint of intermediate tarsi slightly broadened.

Length 9 mm.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. February. "On *Melaleuca* bloom. Rare." (*Giles.*)

The shape of the pygidium is remarkable. This species is doubtfully distinct from *morosus* Sm.

POGONOTHYNNUS VESTITUS Sm. (Plate XXXI. figs. 9 ♂, 10 ♀.)

Thynnus vestitus Sm. Cat. Hym. B. M. vii. p. 15 (1859), ♂; Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 209 (1908), ♂.

♂. The hypopygium of the male is lanceolate beyond the basal spines, long and narrow, ending in an acute spine; similar in shape to that of *fenestratus* Sm. In the type, the only specimen I had seen until Mr. Giles' collection came to hand, the hypopygium was broken.

♀. Head not quite half as broad again as long, slightly convex, not thick, rounded at the posterior angles, very sparsely and shallowly punctured, shining, the front coarsely punctured in the middle; a small arched concave space above the base of each antenna extending nearly to the eye. Clypeus without a carina; scape of the antennæ very finely and sparsely punctured. Pronotum a little narrower than the head, much broader anteriorly than long, but very little broader posteriorly than long; broadly emarginate anteriorly, with a row of setigerous punctures along the margin; the remainder of the pronotum shining and almost smooth. Pleuræ smooth and shining; scutellum narrowed posteriorly, smooth in the middle, punctured on the sides. Median segment shorter than the scutellum, broadened from the base and abruptly truncate posteriorly, almost smooth in the middle and on the face of the truncation, punctured on the sides. Abdomen stout; the first segment truncate at the base, as broad as the second, the dorsal surface with six strong transverse carinæ including the recurved apical margin; the second segment with the same number of carinæ; segments 3–5 shining, with a few scattered punctures. Fifth ventral segment with strong broadly curved striæ. Pygidium narrowed at the base, with two or three arched carinæ; steeply sloped posteriorly, with three arched carinæ at the base of the truncation; the dorsal plate not reaching to the apex of the ventral, broadened from the base and truncate at apex; the ventral plate rounded at the apex. Intermediate tibiæ very broad.

Length 11–13 mm.

Hab. South Perth, W. A. (*H. M. Giles*). 4 pairs in cop. March.

"On *Leptospermum* bloom; not common." (*Giles.*)

The male hypopygium is of the same shape as that of *fenestratus* Sm., and the sculpture of the two basal dorsal segments of the female is very similar, though there is one carina less on each segment in *fenestratus*. That species also has lateral lobes at the apex of the dorsal plate of the pygidium, and the number of the arched carinæ on the plate is greater.

ZASPILOTHYNNUS TRILOBATUS, sp. n.

♂. Clypeus rather prominent at the base, then almost vertically depressed and broadly truncate at the apex, longitudinally striated, punctured on the sides. Head closely punctured, finely rugose on the front; the interantennal prominence very broadly rounded at the apex, connected with the base of the clypeus by a short carina; a fine longitudinal carina below the anterior ocellus. Antennæ inserted a little further from each other than from the eyes, scarcely as long as the thorax without the median segment, and of almost even thickness throughout. Thorax, median segment, and abdomen closely punctured, more finely on the median segment and abdomen than on the thorax; the pronotum punctured-rugulose, slightly narrowed anteriorly, the anterior margin strongly raised; median segment rounded at the sides, obliquely flattened posteriorly, with a shallow sulcus from the base to the middle. Abdominal segments 2–5 moderately constricted at the base, with a curved, slightly raised mark on each side close to the apical margin; the abdomen elongate, tapering at the extremities. Sixth ventral segment with an acute spine on each side at the apical angles; seventh dorsal segment produced from the base into a flattened plate, longitudinally striated and truncate at the apex. Hypopygium with a blunt tooth on each side at the basal angles, thence produced in an elongate-triangular form and narrowly rounded at the apex, transversely striated above, with an obscure longitudinal carina and without an apical spine. The anterior coxæ are not concave, and the groove between the first two ventral segments of the abdomen is shallow, the second segment without a tubercle at the base. The second recurrent nervure is received just before one-quarter from the base of the third cubital cell.

Black with sparse grey pubescence; the apical abdominal segment ferruginous red. Wings hyaline, nervures black.

Length 13 mm.

♀. Clypeus without a carina, transverse. Head subrectangular, slightly rounded at the posterior angles, more than half as broad again as long, sparsely but coarsely punctured. Pronotum sparsely punctured, with a row of large setigerous punctures on the anterior margin, nearly twice as broad anteriorly as long, slightly narrowed posteriorly. Scutellum very sparsely, median segment more closely punctured, as long as the scutellum, broadened from the base and obliquely truncate posteriorly, the surface of the truncation very minutely and closely punctured. First abdominal segment closely punctured, smooth at the extreme apex and with the apical margin slightly raised, with a shallow groove before it; second segment with about eight irregular transverse carinæ, lowest at the base, including the raised apical margin, which is further from the other carinæ than they are from each other; third and fourth segments smooth at the base and apex, punctured in the middle; fifth dorsal segment smooth at the base, sparsely punctured in the middle, with a few delicate curved striæ at the apex; fifth ventral segment coarsely longitudinally striated. Pygidium not very narrow at the base, obliquely sloped posteriorly and slightly broadened; with three Λ-shaped carinæ at the base of the slope, the apex of the dorsal plate strongly trilobed, the ventral plate extending much beyond the dorsal, rounded at the apex, with a very feeble emargination in the middle.

Black; the two apical segments ferruginous red.

Length 10 mm.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. 2 ♂, 2 ♀. October.

"On *Leptospermum* and *Stypelia* bloom. Rare." (*Giles.*)

Nearly allied in structural details to *Z. pseustes* Turn.

A male in the Berlin Museum, from Adelaide, has the apex of the sixth dorsal segment red and the flattened dorsal plate of the seventh less strongly striated.

ZASPILOTHYNNUS CRUDELIS Turn.

Thynnus crudelis Turn. Proc. Linn. Soc. N.S.W. xxxiii. pp. 83, 238 (1908), ♂.

? *Enteles wagneri* Schulz, Fauna Südwest Australiens, i. 13, p. 452 (1908), ♂.

♀. Clypeus without a carina. Head more than half as broad again anteriorly as long, strongly rounded at the posterior angles, strongly but not very closely punctured, with a short and almost obsolete longitudinal frontal sulcus. Pronotum almost rectangular, about one-quarter broader than long, finely, but not very closely punctured, with a few scattered grey hairs, longest on the anterior margin. Median segment finely and closely punctured, more than half as long as the pronotum, broadened from the base and obliquely truncate posteriorly, the surface of the truncation microscopically punctured. First abdominal segment concavo-truncate anteriorly, the dorsal surface coarsely rugose; second segment with about nine irregular transverse carinæ, including the strongly raised apical margin, the apical carinæ much higher than the basal; segments 3–5 smooth or very delicately aciculate at the base, finely and closely punctured at the apex; fifth ventral segment coarsely longitudinally striated. Pygidium not very narrow at the base, vertically truncate posteriorly, with about four arched carinæ before the base of the truncation, the surface of the truncation elongate oval, smooth, with two arched carinæ at the base, the ventral plate extending beyond the dorsal and both rounded at the apex.

Dark fuscous brown; head and legs dull ferruginous; pronotum and pygidium fusco-ferruginous.

Length 10 mm.

Hab. Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. October.

"On *Stypelia* bloom. Rare." (*Giles*.)

Very similar to *trilobatus* in general appearance, but the hypopygium of the male and pygidium of the female are very different.

I am not sure which name has priority for this species. Schulz's description was published apparently late in June, though no date is given; whereas my diagnosis in the key to the species appeared early in June, though the full description did not appear until August. I feel little doubt that the descriptions refer to the same species, though Schulz does not give any notice of an apical spine on the hypopygium either in the text or the figure; but this spine is very liable to be broken in many species. The species is in no way connected with *Enteles*, in which the males always have the apical spine strongly recurved as in *Rhagigaster*.

ZASPILOTHYNNUS LIGNATUS, sp. n.

♂. Clypeus strongly convex, coarsely punctured, with a low median carina not reaching the apex, produced and rather broadly truncate at the apex, the apical margin obliquely depressed and smooth; labrum prominent, broad and feebly bilobed. Head closely punctured-rugose, the interantennal prominence rounded at the apex; antennæ a little longer than the thorax and median segment combined, the apical joint more slender than the others. Thorax finely and very closely punctured; the pronotum nearly as broad as the head, the anterior margin slightly raised; scutellum subtriangular, narrowly truncate at the apex. Median segment short, very finely punctured-rugulose. Abdomen elongate, tapering slightly at the extremities, very finely and closely punctured; the segments very feebly constricted at the base, the first dorsal segment with a tubercle at the base, the sixth segment more sparsely and coarsely punctured; the seventh deflexed, very broadly rounded at the apex, with strong curved transverse striæ. Hypopygium subtriangular, the basal angles bluntly produced, the apex narrowly rounded, without a spine. Second abscissa of the radius shorter than the third; second recurrent nervure received at one-quarter from the base of the third cubital cell. Sixth ventral segment with a very short spine at the apical angles.

Black; legs fusco-ferruginous. Wings hyaline, the radial cell clouded with fuscous along the costa; nervures black.

Length 22-24 mm.

♀. Clypeus without a carina, truncate at the apex, shining, with a few scattered punctures. Head rather small, half as broad again as long, rounded at the posterior angles, deeply punctured, the front closely, the vertex rather sparsely, the punctures bearing short grey hairs. Pronotum rectangular, half as broad again as long, sparsely and deeply punctured, the punctures along the anterior margin setigerous, the pronotum quite as broad as the head; scutellum and median segment coarsely punctured; the scutellum broader than long, as long as the median segment. First dorsal segment of the abdomen coarsely punctured, the apical margin raised, with a transverse groove before it; second segment with five well-marked transverse carinæ including the raised apical margin; segments 3-5 smooth at the base, sparsely punctured at the apex. Fifth ventral segment coarsely transversely striated. Pygidium rather narrow, deflexed and truncate posteriorly, with five arched striæ at the base, slightly widened to the apex and more than three times as long as broad. Intermediate tibiæ moderately thickened, basal joint of intermediate tarsi slightly broadened.

Black; with sparse white pubescence on the sides of the abdomen; mandibles, legs, pygidium, and carinæ of the second dorsal segment fusco-ferruginous.

Length 13 mm.

Hab. Claremont, W. A. (*H. M. Giles*). ♂ ♀ in cop. 2 ♂, 2 ♀. December.

"On *Eucalyptus* bloom. Rare."

ZASPILOTHYNNUS DILATATUS Sm.

Thynnus dilatatus Sm. Cat. Hym. B. M. vii. p. 43 (1859), ♀.

Thynnus atrox Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 237 (1908), ♂.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. November.

"On *Leptospermum*, occasionally on *Eucalyptus*. One of our commonest species." (*Giles*.)

ZASPILOTHYNNUS NEGLECTUS, sp. n.

Extremely near *Z. novaræ* Sauss. in both sexes, but differs as follows:—

♂. The delicate frontal sulcus is longer, reaching from the anterior ocellus to the apex of the interantennal prominence; the hypopygium is much more broadly triangular, with the basal angles rounded and not produced into lobes.

♀. Anterior margin of the pronotum more strongly emarginate; intermediate tibiæ thicker, very broad, though they are considerably thickened in *novaræ*; pygidium strongly constricted at the base of the truncation, the surface of the truncation very broadly ovate, nearly as broad in the middle as long; the apical half smooth, the basal half marked with five Λ-shaped carinæ as in *novaræ*.

Length, ♂ 15 mm., ♀ 12 mm.

Hab. New South Wales (*Staudinger*). Types in B. M. ex coll. Turner. A female in the Berlin Museum.

The species in this group are very closely allied, *Z. novaræ* being intermediate between *pseustes* Turn. and *neglectus*. *Z. pseustes* has the clypeus yellow and less strongly sculptured in the male, while the pygidium of the female has lateral lobes near the apex and is a more slender insect.

Z. dilatatus Sm. is also closely allied, the intermediate tibiæ of the female being much thickened and the truncation of the pygidium broad as in *neglectus*, but the pygidium is not contracted before the truncation.

ZASPILOTHYNNUS NIGRIPES Guér.

Thynnoides nigripes Guér. Mag. de Zool. xii. p. 10 (1842), ♂.

♂. Clypeus punctured-rugose, moderately convex, the apical margin straight but not very broad; antennæ as long as the thorax without the median segment, of even thickness throughout; the interantennal prominence bilobed. The whole insect closely punctured, with sparse greyish-white pubescence. Median segment not truncate, broad, with an obscure median sulcus. Abdomen elongate; segments 2–5 with an impressed transverse line near the base, the base of the segments before the line almost smooth. Second ventral segment with a tubercle at the base; a spine on each side at the apical angles of the sixth ventral segment. Seventh dorsal segment without a produced flattened plate, the basal portion marked with strong rounded striæ, the apex strongly deflexed and transversely striated. Hypopygium elongate-triangular, with prominent basal angles, the apical spine feebly recurved.

Black. Wings hyaline faintly flushed with purple, nervures black.

Length 20–22 mm.

♀. Clypeus without a carina; head and pronotum deeply but rather sparsely punctured, more closely on the front; head moderately thick, much broader than long; the eyes separated from the base of the mandibles by nearly half their own length. Pronotum subrectangular, slightly narrowed posteriorly, nearly twice as broad as long, the punctures on the anterior margin deep and setigerous. Scutellum sparsely punctured; median segment minutely and closely punctured, with a few large scattered punctures, as long as the scutellum and broadened from the base, the surface of the posterior truncation almost smooth. First abdominal segment truncate at the base, sparsely punctured immediately above the truncation, then irregularly transversely striated, the striæ low and about four in number, the apical margin raised, with a deep groove before it; second segment with many transverse striæ, the striæ irregular and more than twelve in number, the basal striæ very low, those near the apex moderately elevated; segments 3–5 smooth at the base, sparsely punctured at the apex; fifth ventral segment coarsely longitudinally striated. Pygidium not much narrowed at the base, obliquely striated near the base, deflexed posteriorly; the posterior surface ovate, with three or four arched carinæ at the base; the extreme apex of the dorsal plate smooth, rounded and slightly recurved, not reaching to the apex of the ventral plate.

Black; head and prothorax ferruginous red; sometimes the scutellum is red also.

Length 15–17 mm.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. 5 ♂, 3 ♀. January and February. One female in the Berlin Museum from Western Australia.

Zaspilothynnus radialis, sp. n. (Plate XXXI. fig. 11, ♂.)

♂. Clypeus large, rather prominent and almost pointed at the base, broadly truncate at the apex, finely longitudinally striated. Antennæ shorter than the thorax and median segment combined, of even thickness throughout; the interantennal prominence broadly V-shaped. Head closely punctured, a very fine longitudinal carina from the apex of the interantennal prominence almost reaching the anterior ocellus. Posterior ocelli a little further from the eyes than from each other. Pronotum shallowly and not very closely punctured, nearly as broad as the head, only slightly narrowed anteriorly, the anterior margin straight and raised. Mesonotum closely, scutellum sparsely punctured. Median segment obliquely truncate from the postscutellum, very finely and closely punctured on the sides, shallowly punctured-rugulose on the surface of the truncation. Abdomen shallowly punctured, the segments not constricted, as long as the head and thorax combined, slightly narrowed at the base and apex; the sixth ventral segment with an acute spine on each side at the apical angles. Dorsal plate of the seventh segment flatly produced and rounded at the apex. Hypopygium obliquely striated above, longer than broad, with a short outwardly curved spine on each side at the base, then sharply narrowed and produced with almost parallel sides to the base of the acute apical spine. The groove between the two basal ventral segments is very shallow. Second and third cubital cells nearly equal in length on the radial nervure, the second recurrent nervure received by the third cubital cell at one-fifth from the base.

Orange-yellow; antennæ, the extreme apex of the mandibles, vertex, mesonotum except a quadrate spot near the middle, mesopleuræ except a spot beneath the anterior wings, mesosternum and the two apical abdominal segments, black. Wings hyaline, tinged with yellow, the radial cell clouded with fuscous; nervures black, except at the base; stigma and costa ferruginous.

Length 18 mm., exp. 28 mm.

Hab. Hermannsburg, Central Australia (*H. J. Hillier*).

This comes nearest to the genus *Zaspilothynnus* Ashm., but is a smaller and slenderer insect than *leachiellus* Westw.

ZASPILOTHYNNUS GILESI, sp. n. (Plate XXXI. figs. 12 ♂, 13 ♀.)

♂. Clypeus large, broadly truncate at the apex, the labrum projecting beyond the clypeus and narrowly truncate at the apex; the clypeus punctured at the extreme base, finely longitudinally striated at the apex, the striæ arching narrowly above the middle. Head closely punctured-rugose; the interantennal prominence broadly rounded at the apex and connected with the base of the clypeus by a very short carina. Antennæ as long as the thorax and median segment combined, of almost even thickness throughout. A few long hairs on the outer margin of the maxillæ. Thorax finely and closely punctured; the middle of the pronotum finely rugulose, the anterior margin slightly raised; the longitudinal furrows on the mesonotum deeply marked; scutellum large and slightly convex. Median segment obliquely truncate from just behind the postscutellum, the surface of the truncation shining and finely rugulose, the sides of the segment sparsely clothed with long whitish pubescence. Abdomen finely and closely punctured, a little longer than the head and thorax combined; the basal segment obliquely truncate anteriorly, narrower at the base than at the apex, as broad at the apex as the second segment; the apical dorsal segment produced into a flattened plate, which is longitudinally striated and rounded at the apex. The groove between the two ventral segments is moderately broad, and there is a small blunt tubercle at the base of the second segment. Sixth ventral segment with a small spine on each side at the apical angles. Hypopygium with a rounded lobe on each side at the base, thence rather broadly produced to the base of the apical spine, obliquely striated above, punctured beneath.

Black; mandibles, clypeus, the inner margin of the eyes as high as the base of the antennæ, the outer margin narrowly to the summit, the anterior margin of the pronotum interrupted in the middle, and a spot usually rather small on each side of dorsal abdominal segments 1–5, yellow. Wings very pale fusco-hyaline, nervures black.

Length 24–27 mm.

Var. *a*. A yellow spot on each side of the sixth dorsal segment.

Var. *b*. Femora ferruginous, abdominal spots enlarged.

♀. Clypeus without a carina. Head moderately convex, shining, sparsely and irregularly punctured, nearly twice as broad as long, slightly narrowed anteriorly, rounded at the posterior angles. Thorax sparsely punctured; the pronotum much broader than long, slightly narrowed posteriorly, broadly emarginate anteriorly, with a row of setigerous punctures along the margin. Median segment as long as the scutellum, broadened from the base and obliquely truncate posteriorly, the surface of the truncation almost smooth. First dorsal abdominal segment obliquely striated, the striæ arched in the middle; second segment with many transverse striæ, higher at the apex than at the base; segments 3–5 with a few scattered punctures near the apex; fifth ventral segment obliquely striated. Pygidium narrowed at the base, then deflexed, broadened and transversely striated, truncate posteriorly, the surface of the truncation smooth and broad; the dorsal plate shorter than the ventral, broadly and shallowly emarginate at the apex, the angles of the emargination produced into blunt lobes. Intermediate tibiæ broad and thick, the basal joint of the intermediate tarsi broad.

Length 14–18 mm.

Var. *b*, in copula with ♂ var. *b*. The surface of the posterior truncation of the pygidium obliquely striated.

Hab. South Perth, W. A. (*H. M. Giles*). ♂ ♀ in cop. January. Also in the Berlin Museum from Western Australia (*Preiss*).

"Common, some seasons scarcer" (*Giles*).

This belongs to the *Zaspilothynnus* group.

ZASPILOTHYNNUS MATURUS, sp. n.

♀. Clypeus without a carina, sparsely punctured, very broadly and shallowly emarginate at the apex. Head slightly convex, shining, sparsely punctured, with a short, longitudinal, frontal sulcus, half as broad again as long and rounded at the posterior angles. Pronotum rather more closely and finely punctured than the head, with a row of large setigerous punctures along the anterior margin, as broad as the head, more than half as broad again as long, slightly narrowed posteriorly. Scutellum and median segment shining, very sparsely punctured; the median segment shorter than the scutellum, broadened from the base and almost vertically truncate posteriorly. First abdominal segment truncate anteriorly, very sparsely punctured, with a few fine transverse striæ before the apex, the apical margin raised, with a broad groove before it; second segment with twelve or more transverse carinæ, those at the base low and irregular, those at the apex higher; segments 3–5 shining, sparsely punctured near the apex; fifth ventral segment longitudinally and coarsely striated. Pygidium narrow at the base, vertically truncated posteriorly, sharply contracted before the base of the truncation, the surface of the truncation large, broadly ovate, with a number of low arched carinæ at the base not reaching the middle, the apex smooth. A tuft of long pale hairs on each side at the base of the pygidium. Intermediate tibiæ very thick and spinose, the basal joint of the intermediate tarsi broadened.

Black; a spot on each side at the posterior angles of the pronotum, a transverse band on the first dorsal abdominal segment above the truncation, a spot on each side of the second segment, a transverse band interrupted in the middle on the third segment and a transverse spot on each side of the fourth, pale yellow. Anterior tibiæ fusco-ferruginous beneath.

Length 17 mm.

Hab. South Perth, W. A. (*H. M. Giles*).

ZASPILOTHYNNUS CLELANDI, sp. n. (Plate XXXI. figs. 14 ♂, 15 ♀.)

♂. Clypeus large, very broadly truncate at the apex, almost pointed at the base, punctured at the extreme base, elsewhere finely longitudinally striated, with sparse punctures between the striæ. Antennæ as long as the thorax without the median segment, of almost even thickness throughout. Head closely punctured; the interantennal prominence broadly rounded at the apex and connected with the base of the clypeus by a very short narrow carina. Thorax and median segment finely and closely punctured, more sparsely on the scutellum and on the disc of the mesonotum; scutellum large and broadly rounded at the apex. Median segment more than half as long as the scutellum on the dorsal surface, then obliquely sloped and subconcave to the apex. Abdomen sparsely punctured, shining, longer than the head, thorax and median segment combined, tapering slightly at the extremities; the apical dorsal segment produced from the base into a small, flat, longitudinally striated plate which is very feebly emarginate at the apex. Sixth ventral segment with a spine on each side at the apical angles. Hypopygium with a blunt spine on each side at the basal angles, thence narrowly produced and elongate to the base of apical spine, transversely striated above, with a median longitudinal carina.

Black; the clypeus, the margins of the eyes interrupted at the summit, the band on the outer margin continued along the posterior margin of the head, the interantennal prominence narrowly continued to the anterior ocellus, the mandibles (except at the apex), the margins of the pronotum, a large spot on the disc of the mesonotum, the tegulæ and a longitudinal line above them, the whole front of the mesopleuræ, a large spot before the intermediate coxæ, the middle of the scutellum very broadly and a spot at each of its anterior angles, the postscutellum, the median segment with a longitudinal black band on each side, a broad transverse band on each of the six basal abdominal segments interrupted in the middle on the dorsal surface, the prosternum, the apex of the mesosternum, the coxæ, the femora beneath and the tibiæ above, yellow. Wings hyaline, nervures black. The labrum is pale testaceous, shallowly emarginate at the apex.

Length 13–20 mm.

♀. Mandibles long, falcate, acute at the apex; the clypeus without a carina. Head smooth and shining, with a few scattered punctures, the front between the antennæ more closely punctured, eyes not touching the base of the mandibles; the head broader than long, strongly rounded at the posterior angles, scarcely convex and rather thin. Pronotum nearly twice as broad as long, the anterior margin almost straight with a row of setigerous punctures, the posterior margin broadly emarginate, finely punctured rugulose. Scutellum and median segment very sparsely punctured; the median segment nearly as long as the scutellum, broadened from the base and almost vertically truncate posteriorly. The intermediate tibiæ and the basal joint of the tarsi are scarcely more thickened than those of the posterior legs. Abdomen very sparsely punctured; the basal segment truncate anteriorly, sparsely clothed with long grey hairs, the apical margin raised, with a transverse groove before it; second segment with seven transverse carinæ lower at the base than at the apex, including the raised apical margin; fifth ventral segment longitudinally striated; pygidium very narrow at the base, almost vertically truncate posteriorly, the surface of the truncation smooth, elongate-ovate, the dorsal plate much shorter than the ventral and produced in the middle at the apex. Pale castaneous brown; the mandibles, the sides of the head, the pleuræ, the fifth abdominal segment, the middle of the second dorsal segment, the base and apex of the third, the extreme apex of the fourth, the middle of the second and third ventral segments, and the femora, black; pygidium and antennæ fusco-ferruginous.

Length 11-12 mm.

Hab. Strelley River, N.W. Australia (*H. M. Giles*). ♂ ♀ in cop. 12 ♂, 7 ♀. October.

"All on two small plants of *Grevillea*" (*Giles*).

A rather distinct species, approaching the *leachiellus* group, but the female shows some points of resemblance to typical *Thynnus*, though differing in the absence of concave areas on the head.

Fam. SCOLIIDÆ.

ANTHOBOSCA STRANDI, sp. n.

♀. Clypeus strongly but rather sparsely punctured, triangularly flattened from near the base to the apex. Front closely and coarsely, vertex more finely punctured; head and pronotum thinly covered with long pale fulvous pubescence. Pronotum and median segment very finely and closely punctured; mesonotum more strongly punctured; scutellum strongly but sparsely punctured, very broadly rounded at the apex. Abdomen shining, very finely punctured, with sparse, long, grey pubescence on the sides; the apical dorsal segment thickly clothed with stiff fusco-ferruginous hairs, rounded at the apex. Pleuræ very finely and closely punctured, the sides of the median segment smooth and shining at the base. Radial cell broadly rounded at the apex, the second abscissa of the radius twice as long as the first and distinctly longer than the third; first recurrent nervure received at one quarter from the base of the second cubital cell; second recurrent received at one-fifth from the base of the third cubital cell.

Black; the apex of the scape and the flagellum beneath fusco-ferruginous; the basal half of the mandibles, tegulæ, tibiæ, tarsi, the apex of the femora and the whole of the posterior femora ferruginous. Wings hyaline, faintly tinged with yellowish brown, nervures fuscous, stigma ferruginous. A dull ferruginous spot on the outer margin of the eyes, close to the summit.

The posterior femora are produced below near the apex into a broadly rounded flattened projection, rather more strongly developed than in most species of the genus.

Length 13 mm.

Hab. The locality on the label is Endeavour River, Queensland, but as other species received from the same source and bearing the same locality are undoubtedly Victorian, I consider that this also is almost certainly from Victoria.

Most nearly allied to *A. cognata* Sm. from the Swan River, but differs in neuration and in the sparser sculpture of the abdomen.

Type in Berlin Museum.

ANTHOBOSCA NUBILIPENNIS, sp. n.

♀. Clypeus coarsely but sparsely punctured, broadly rounded at the apex. Scape smooth above, very sparsely punctured beneath and with a few short hairs. Head sparsely but deeply punctured, the front rugose in the middle, the vertex behind the ocelli almost smooth. Eyes very broadly and feebly emarginate on the inner margin. Pronotum and scutellum coarsely but not closely punctured, the pronotum almost as wide as the head; mesonotum as long as the pronotum, smooth, with a few scattered punctures on the sides and near the posterior margin; propleuræ punctured above and in front, obliquely striated below and behind; mesopleuræ coarsely but not very closely punctured; the sides of the median segment obliquely striated. Scutellum very broadly rounded at the apex. Median segment finely rugose, subtuberculate in the middle at the base, shorter than the scutellum, abruptly and almost vertically truncate posteriorly, the surface of the truncation shining and almost smooth. Abdomen rather sparsely punctured, more closely and finely at the base of the third and fourth segments, the basal segment almost smooth. Sixth dorsal segment coarsely longitudinally striated from the base to beyond the middle, the apex rounded and very delicately rugulose; the ventral plate subtriangular, very narrowly rounded at the apex. Wings rather short, the second abscissa of the radius half as long again as the first, the third nearly half as long again as the second. Radial cell very narrowly rounded at the apex, almost pointed, separated from the costa at the apex; stigma small and narrow. First recurrent nervure received by the second cubital cell at two-thirds from the base, second received by the third cubital cell just before one quarter from the base.

Black, with very sparse grey pubescence; the tarsal ungues fusco-ferruginous. Wings fusco-hyaline, nervures fuscous.

Length 16 mm.; length of costa 8 mm.

Hab. Claremont, W. A. (*H. M. Giles*). December.

Well distinguished by the truncated median segment and the coarse longitudinal carinæ on the pygidium.

Anthobosca gilesi, sp. n. (Plate XXXII. fig. 4, ♂.)

♂. Clypeus convex, closely punctured, rounded at the sides, truncate at the apex. Antennæ shorter than the thorax and median segment combined, very stout, inserted nearer to each other than to the eyes; the second joint of the flagellum nearly as broad as long, much shorter than the third joint. Head, thorax, and median segment very finely and closely punctured; the posterior ocelli as far from each other as from the eyes; the pronotum rounded anteriorly; the scutellum broadly truncate at the apex, with an obscure median carina on the apical half. Median segment very little longer than the scutellum, almost rectangular, nearly twice as broad as long. Abdomen tapering to the apex, the apical segment very narrowly rounded, the basal segments finely shagreened, the two apical segments very finely and closely punctured. Second abscissa of the radius twice as long as the first and half as long as the third, the first recurrent nervure received just beyond the middle of the second cubital cell, the second just beyond one quarter from the base of the third cubital cell.

Black; the base and sides of the clypeus, a broad band on the posterior margin of the pronotum, and the tegulæ yellow; femora, tibiæ, and tarsi ferruginous. Wings hyaline, nervures black, yellow at the base.

Length 11–14 mm.

Hab. South Perth, W. A. (*H. M. Giles*). January. 3 ♂.

The first abdominal segment is longer than the second and is narrowed towards the base. The tarsal ungues are thickened and bluntly produced at the base, not bidentate at the apex. The abdomen is much broader at the base than in *A. australasiæ* Guér., and the tarsal ungues are less distinctly toothed. The yellow marks on the clypeus vary much both in size and position, in one specimen the base is black and the apex yellow.

Fam. CEROPALIDÆ.

In working on this family I have attempted to use the classifications of Kohl and Ashmead. The former is, however, hardly to be taken as more than a sketch, and is not worked out with much detail, though useful as far as it goes. Ashmead on the contrary makes many new genera, some of which will doubtless stand, but the characteristics given are often insufficient; and too much importance is attached to minute points of neuration, which an examination of a large collection shows to be often more or less variable in geographical races. But the habit of this author of taking undescribed species as the types of his genera is most objectionable, and no editor should have published work in which such a fault is evident. The form of his tables is also occasionally incorrect or unfinished, making them very difficult to follow.

AGENIA BARBATULA, sp. n.

♀. Clypeus transverse at the apex, twice as broad as long; a tuft of very long pale creamy hairs at the base of the maxillæ. Eyes scarcely touching the base of the mandibles, a little nearer together on the vertex than on the clypeus; posterior ocelli a little further from each other than from the eyes. Antennæ a little longer than the thorax and median segment combined, the second joint of the flagellum half as long again as the third and at least three times as long as the first. Pronotum nearly as long as the mesonotum, narrowed and rounded anteriorly, the posterior margin very feebly arched. Median segment much longer than broad, with an obscure median sulcus, roundly depressed near the apex. Shining, microscopically punctured; the median segment opaque, finely shagreened. Abdomen ovate, with a short petiole. Tarsal ungues with a tooth beyond the middle. Radial cell broad, second abscissa of the radius nearly twice as long as the third, first recurrent nervure received at the middle of the second cubital cell, second before one quarter from the base of the third cubital cell. Median cell scarcely shorter than the submedian; cubitus of the hind wing originating well beyond the transverse median nervure.

Black; legs and antennæ dark fusco-ferruginous, mesonotum and abdomen with a bluish gloss. Wings hyaline, a fuscous band crossing the wing at the basal nervure, a broader one from the stigma not reaching beyond the discoidal cell.

Length 6 mm.

Hab. Mackay, Q. (*Turner*). November.

This is the first species of the genus recorded from Australia, for *Pogonius lunulatus* Sauss. seems to belong to *Pseudagenia*.

AGENIA GILESI, sp. n.

♀. Clypeus transverse at the apex, fully twice as broad as long, the labrum exposed and broad. Eyes not nearly reaching the base of the mandibles, the inner margins nearly parallel; ocelli in a broad triangle, the posterior pair as far from each other as from the eyes. Antennæ scarcely longer than the thorax and median segment combined; the second joint of the flagellum equal in length to the third. Pronotum not depressed or narrowed anteriorly, as broad as the head and as long as the mesonotum. Median segment broader than long, steeply sloped posteriorly. Abdomen subpetiolate, ovate, the apical segment broadly rounded at the apex. Microscopically punctured; head, thorax, and median segment opaque, abdomen shining. Legs not very long, posterior tibiæ quite smooth, tarsal ungues with one tooth. Radial cell broad, second abscissa of the radius nearly as long as the third, first recurrent nervure received beyond the middle of the second cubital cell, second before one-third from the base of the third cubital cell. Submedian cell equal in length to the median; cubitus of the hind wing originating some distance beyond the transverse median nervure. Black; legs fusco-ferruginous. Wings hyaline, crossed by a fuscous band which extends from the basal nervure to the middle of the radial cell; a small fuscous cloud at the apex.

Length 8 mm.

Hab. South Perth, W. A. (*H. M. Giles*). January.

Differs from the characters of *Agenia* as given by Ashmead in the eyes not reaching the base of the mandibles. I have been unable to see any long hairs at the base of the maxillæ, but the general facies is that of *Agenia* rather than of *Pseudagenia*.

Key to the species of *Pseudagenia* mentioned here.

♀♀.

A. Abdomen and thorax marked with yellow	*P. gilberti.*
B. Abdomen and thorax without yellow markings.	
a. Antennæ black, rarely marked with white.	
a^2. Fifth joint of the flagellum creamy white above ..	*P. æneopilosa.*
b^2. Antennæ entirely black.	
a^3. Clypeus narrowly produced into a stout tooth...	*P. camilla.*
b^3. Clypeus broadly rounded or transverse at the apex.	
a^4. Thorax and abdomen glossed with steel-blue. Length 4 mm.	*P. una.*
b^4. Thorax and abdomen entirely black. Length 8-13 mm.	
a^5. Median segment longer than broad	*P. valeria.*
b^5. Median segment broader than long	*P. dispersa.*
b. Antennæ entirely or in great part orange-yellow.	
a^2. Wings fuscous, without darker bands.	
a^3. Three basal joints of antennæ only orange. Front with golden pubescence...	*P. flavicornis* Sm.
b^3. Eight basal joints of antennæ orange. Pubescence on front paler	*P. provida.*
b^2. Wings hyaline or fusco-hyaline, crossed by fuscous bands.	
a^3. Wings fusco-hyaline.	
a^4. Clypeus shallowly bisinuate, with a short median tooth	*P. consociata.*
b^4. Clypeus transverse at the apex	*P. novaræ* Sauss.
b^3. Wings clear hyaline.	
a^4. Median segment rather coarsely transversely striated	*P. fasciata* Fabr.
b^4. Median segment not transversely striated.	
a^5. Median segment without a median sulcus. Length 7 mm...........................	*P. cornelia.*
b^5. Median segment with a shallow median sulcus.	
a^6. Median segment longer than broad	*P. fusiformis* Sauss.
b^6. Median segment as broad or broader than long..	*P. australis* Cam.

The species seem to vary geographically to a certain degree as to the relative size of the cubital cells.

PSEUDAGENIA UNA, sp. n.

♀. Clypeus transverse at the apex, more than three times as broad as long; eyes not quite touching the base of the mandibles, their inner margins nearly parallel; posterior ocelli nearly half as far again from the eyes as from each other. Antennæ rather slender, longer than the head, thorax and median segment combined; the second joint of the flagellum only a little longer than the third. Closely microscopically punctured and slightly shining. Head nearly twice as broad as the thorax. Pronotum broad, nearly as long as the mesonotum, slightly rounded at the anterior angles; median segment slender, convex, at least twice as long as broad. Abdomen small, subpetiolate, shorter than the thorax and median segment combined. Second cubital cell almost triangular, nearly pointed on the radial nervure, third abscissa of the radius less than half as long again as the first, the third cubital cell short, very little longer than the second on the cubitus. Radial cell rather short, rounded at the apex; recurrent nervures received close to the middle of the second and third cubital cells; cubitus of the hind wing originating far beyond the transverse median nervure. Legs smooth.

Black, glossed with dark steely blue. Wings hyaline, crossed by a fuscous band at the basal nervure and by a very broad pale fuscous band almost reaching the apex from the base of the radial cell. Mandibles fusco-ferruginous.

Length 4 mm.

Hab. Mackay, Q. (*Turner*). March.

The neuration of this species is most like *Agenia*, but I cannot see the tuft of long hairs at the base of the maxillæ characteristic of that genus, so place it provisionally in *Pseudagenia*.

PSEUDAGENIA GILBERTI, sp. n.

♀. Clypeus broadly rounded anteriorly, much broader than long, slightly convex. Eyes almost touching the base of the mandibles, a little nearer together on the vertex than on the clypeus; the posterior ocelli further from the eyes than from each other. Second joint of the flagellum nearly half as long again as the third. Pronotum rather short, broadly rounded anteriorly; median segment obliquely sloped, a little longer than broad. Abdomen petiolate, the petiole occupying about one-third of the length of the first segment. Legs long and slender, the tarsal ungues with one tooth. Third abscissa of the radius more than half as long again as the second, first recurrent nervure received beyond the middle of the second cubital cell, second before one third from the base of the third cubital cell; submedian cell longer than the median; cubitus of the hind wing originating just beyond the transverse median nervure, almost interstitial. Second ventral segment with a well-marked transverse groove near the base.

Black; the anterior half of the clypeus, the margins of the eyes very narrowly not reaching the summit, a spot on the propleuræ, pronotum stained with black on the middle and sides, tegulæ, a transverse band on the scutellum, another broader on the post-scutellum, the apex of the median segment produced in the middle into a longitudinal band which almost reaches the base, apex of the first abdominal segment, four apical segments, coxæ beneath, and a spot before the intermediate coxæ, yellow; first abdominal segment (except the petiole) legs and nine apical joints of the flagellum pale ferruginous brown. Front, pleuræ, coxæ, and abdomen with short golden pile, only showing in some lights. Wings hyaline, faintly clouded with fuscous along the costa, nervures ferruginous brown.

Length 12 mm.

♂. Similar, but with the first abdominal segment more slender, and the front round the base of the antennæ yellow.

Hab. Mackay, Q. (*Turner*).

PSEUDAGENIA CAMILLA, sp. n.

♀. Clypeus about twice as broad as the greatest length, produced at the apex into a long blunt tooth; inner margins of the eyes almost parallel, posterior ocelli more than half as far again from the eyes as from each other; eyes touching the base of the mandibles. Second joint of the flagellum more than half as long again as the third. Pronotum a little depressed anteriorly, strongly rounded at the anterior angles, the posterior margin broadly arched. Median segment transversely striated, much longer than broad, not truncate or sharply sloped posteriorly. Abdomen with a short petiole. Hind tibiæ with a few minute spines, tarsal ungues with one tooth. Second abscissa of the radius half as long again as the third; first recurrent nervure received before the middle of the second cubital cell, second at one-third from the base of the third cubital cell; submedian cell a little longer than the median; cubitus of the hind wing originating beyond the transverse median nervure.

Black; the mandibles ferruginous at the apex; head and thorax opaque; abdomen shining, with bluish reflections, covered with short griseous pile. Wings hyaline; a fuscous band crossing the wing at the basal nervure, another, much broader, from the radial cell.

Length 9 mm.

Hab. Mackay, Q. (*Turner*).

PSEUDAGENIA ÆNEOPILOSA, sp. n.

♀. Clypeus transverse at the apex, about three times as broad as long; the labrum slightly exposed, emarginate at the apex. Eyes separated on the vertex by a distance about equal to the length of the second joint of the flagellum, a little further apart at the base of the clypeus, just touching the base of the mandibles; posterior ocelli rather nearer to each other than to the eyes. Second joint of the flagellum less than one-third longer than the third. Opaque, pruinose. Pronotum less than half as long as the mesonotum, broadly arched posteriorly. Median segment longer than broad, finely transversely striated, with a shallow median sulcus not reaching the apex, not truncate or steeply sloped posteriorly. Abdomen with a very short petiole, the segments except the first covered with short, very pale, golden pile. Hind tibiæ feebly spined; tarsal ungues toothed. Second abscissa of the radius a little longer than the third, recurrent nervures received just before the middle of the second and third cubital cells; submedian cell longer than median; cubitus of hind wing originating just beyond the transverse median nervure.

Black; the fifth joint of the flagellum beneath, the apex of the fourth and base of the fifth creamy white. Wings hyaline, a fuscous band crossing the wing at the basal nervure, another, much broader, from the base of the radial cell.

Length 11 mm.

Hab. Mackay, Q. (*Turner*).

PSEUDAGENIA VALERIA, sp. n.

♀. Clypeus about twice as broad as long, broadly rounded at the apex. Eyes touching the base of the mandibles, the inner margins nearly parallel; posterior ocelli about half as far again from the eyes as from each other. Antennæ slender, the second joint of the flagellum about one-fifth longer than the third. Pronotum depressed anteriorly and strongly rounded at the angles, the posterior margin feebly arched. Median segment slender, longer than broad, gently sloped posteriorly, indistinctly transversely striated, with an obscure median sulcus at the base. Abdomen petiolate, fusiform, the petiole occupying one-third of the length of the basal segment. Legs slender, posterior tibiæ smooth. Second abscissa of the radius as long as the third, second cubital cell nearly as long on the cubitus as the third; first recurrent nervure received well before the middle of the second cubital cell, second at one-third from the base of the third cubital cell; submedian cell longer than the median; cubitus of hind wing originating a little beyond the transverse median nervure.

Opaque black; tegulæ fuscous. Wings hyaline, a broad fuscous band crossing the wing at the basal nervure, another very broad from the radial cell, leaving a small hyaline patch at the apex.

Length 8 mm.

Hab. Cairns, Q. (*Turner*). February.

Very near *numeria* Sm. from Mysole, but in this species the median segment is longer, and *numeria* has the third cubital cell much shorter than the second on the radial nervure especially, the recurrent nervures are also both received nearer the middle of the cells. From *camilla* this species may be easily distinguished by the form of the clypeus.

PSEUDAGENIA DISPERSA, sp. n.

♀. Anterior margin of the clypeus very slightly arched; head wider than the thorax; posterior ocelli about half as far again from the eyes as from each other; eyes separated on the vertex by a distance about equal to the length of the first and second joints of the flagellum combined, and by almost the same distance on the clypeus; the second joint of the flagellum more than half as long again as the first. Pronotum not much narrowed anteriorly, its posterior margin arched. Median segment finely transversely striated, convexly declivous, broader than long, with a longitudinal median sulcus. Abdomen subpetiolate, the first segment shorter than the second, narrowed at the base, but without a distinct petiole. Pruinose and subopaque.

Black, with short silver pile on the clypeus, face, pleuræ, and coxæ. Wings hyaline, with a very narrow fuscous band along the basal nervure of the fore wing. another much broader half crossing the wing from the base of the radial cell, the apex of both wings slightly clouded with fuscous. Second abscissa of the radius nearly equal to the third, second transverse cubital nervure short, the radial cell very broad. Cubitus of the hind wing originating just before the transverse median nervure.

Length 13 mm.

Hab. Mackay, Q. (*Turner*).

Very near *callisto* Sm. from Aru, but differs in the absence of a distinct petiole to the first segment of the abdomen, in the sculpture of the median segment, the greater distance between the eyes on the vertex, the short second transverse cubital nervure, and the point of origin of the cubitus of the hind wing, which in *callisto* is just beyond the transverse median nervure. The Indian species identified as *callisto* by Colonel Bingham is intermediate in the form of the petiole, but differs both from *callisto* and *dispersa* in the form of the median segment which is slender and much longer than broad. *P. erigone* Bingh. is really nearer to the present species than his *callisto*. The difference in the point of origin of the cubitus of the hind wing is interesting as showing the slight systematic importance that can be attached to a character largely used by both Kohl and Ashmead in their classifications of the family.

PSEUDAGENIA FASCIATA Fabr. (Plate XXXII. fig. 5, ♀.)

Sphex fasciata Fabr. Syst. Ent. p. 350 (1775), ♀.

Hab. Mackay to Cooktown, Q. (*Turner*).

This species is very near the last, but has the antennæ yellow, and differs in the neuration and in the form of the clypeus. The submedian cell of the fore wing is very much longer than the median, the third abscissa of the radius half as long again as the second, the cubitus of the hind wing originates beyond the transverse median nervure.

PSEUDAGENIA AUSTRALIS Cam.

Pseudagenia australis Cam. Entomologist, 1906. ♂.

This species has the second abscissa of the radius scarcely more than half as long as the third. My specimens are from Victoria. I doubt if it is more than a geographical race of *fasciata* Fabr.

Pseudagenia fusiformis Sauss.

Agenia fusiformis Sauss. Reise d. Novara, Zool. ii. Hym. i. p. 53 (1867), ♀.

Hab. Sydney, N.S.W.; Mackay, Q. (*Turner*).

The second abscissa of the radius is longer than in *australis* Cam.. and the petiole is longer; it is also a smaller species.

Pseudagenia novaræ Sauss.

Agenia novaræ Sauss. Reise d. Novara, Zool. ii. Hym. i. p. 54 (1867), ♂.

Nearly allied to *P. fasciata* Fabr., but is a larger insect. The female has the antennæ shorter and stouter than in *fasciata*; the clypeus shorter, less convex and more broadly truncate at the apex; the abdomen less distinctly petiolate, the apical segment more pointed, and the wings clouded with fuscous.

Hab. Victoria and New South Wales.

Pseudagenia cornelia, sp. n.

♀. Clypeus very short, broadly rounded anteriorly, very slightly convex. Head thin; eyes touching the base of the mandibles; ocelli situated very near the posterior margin of the head, the posterior pair near together, more than half as far again from the eyes as from each other. Antennæ longer than the head, thorax and median segment combined; the second joint of the flagellum half as long again as the first. Thorax narrower than the head; pronotum rounded anteriorly, much shorter than the mesonotum. Median segment flattened, finely granulate, opaque, as long as broad, narrowed to the apex. Abdomen shining, elongate-ovate, with a short petiole, the apical segment narrow and pointed. Second abscissa of the radius less than half as long as the first; first recurrent nervure received before the middle of the second cubital cell, second at one-third from the base of the third cubital cell; submedian cell very little longer than the median; cubitus of hind wing interstitial with the transverse median nervure.

Black; the antennæ orange-yellow, the scape black at the base, the apical joint fuscous. Wings hyaline, with a fuscous mark at the base of the radial cell extending through the second cubital cell into the discoidal cell.

Length 7 mm.

Hab. Mackay, Q. (*Turner*).

Pseudagenia consociata, sp. n.

♀. Clypeus less than twice as broad as long, feebly bisinuate on the rather narrow apical margin, with a very short tooth in the middle, slightly convex. Eyes slightly convergent towards the vertex, almost touching the base of the mandibles; posterior ocelli about half as far again from the eyes as from each other. Antennæ moderately long; second joint of the flagellum fully half as long again as the third. Pronotum depressed, narrowed and rounded anteriorly, the posterior margin arched. Median segment convex, about as long as broad, coarsely transversely striated, with a broad, shallow, median sulcus. Abdomen with a short petiole; the petiole distinctly longer than in *fasciata* Fabr., occupying about one-third of the length of the first segment; apical segment with a flat, oval, pygidial area, shining and sparsely punctured. Third abscissa of the radius about one-third longer than the second, first recurrent nervure received before the middle of the second cubital cell, second at one-third from the base of the third cubital cell; cubitus of the hind wing originating just beyond the transverse median nervure. Posterior tibiæ with very small spines; tarsal ungues with one tooth near the middle.

Black; pruinose; seven basal joints of the antennæ and the eighth and ninth beneath orange. Wings fusco-hyaline, with the usual two darker transverse bands, one narrow on the basal nervure, the other broad and not quite crossing the wing from the radial cell.

♂. As in the female, but the antennæ are very long and slender, as long as the thorax and abdomen combined, the clypeus less than twice as long as broad, median segment half as long again as broad, less convex and more finely striated; petiole long; the first abdominal segment only very slightly widened at the apex, much longer and narrower than in *fasciata* ♂. Base of the mandibles, sides of the clypeus, and inner orbits of the eyes as high as the base of the antennæ, pale yellow.

Length ♀ 14 mm., ♂ 12 mm.

Hab. Mackay and Cairns, Q. (*Turner*).

Very near *fasciata* Fabr., but in that species the wings are hyaline with fuscous bands, the petiole shorter, the second joint of the flagellum shorter in proportion to the third, the clypeus rounded at the apex, and the three apical joints of the flagellum only black. The first recurrent nervure in *fasciata* is received beyond the middle of the second cubital cell, the second only just before the middle of the third.

PSEUDAGENIA PROVIDA, sp. n.

♀. Black; the clypeus and front as high as the base of the antennæ with short silvery pubescence slightly tinted with yellow; seven basal joints of the antennæ bright orange-yellow. Wings fuscous, hyaline tinted with fuscous from near the base of the third cubital cell.

Very near *P. flavicornis* Sm. Second joint of flagellum half as long again as third, in *flavicornis* the third joint is a little shorter; clypeus very broadly rounded at the apex; head broad. Pronotum more than half as long as the mesonotum, the posterior margin very feebly arched; median segment transversely striated, with a shallow median sulcus, about twice as broad as long. Abdomen subpetiolate. Third abscissa of the radius more than half as long again as the second, first recurrent nervure received beyond two-thirds from the base of the second cubital cell, second at one-third from the base of the third cubital cell; submedian cell longer than median; cubitus of hind wing originating just beyond the transverse median nervure.

Length 20 mm.

Hab. Mackay, Q. (*Turner*); Melbourne (*French*).

In *flavicornis* ♀ the three or four basal joints of the antennæ only are yellow, the pubescence on the front is golden, the median segment is slightly longer in proportion to the breadth, the head and clypeus narrower, and the whole insect smaller and less stoutly built; the second recurrent nervure is received only just before the middle of the third cubital cell, and the wings are darker at the apex. It also occurs at Mackay, but does not seem to have as wide a range as the present species.

PSEUDAGENIA LUNULATA Sauss.

Pogonius lunulatus Sauss. Reise d. Novara, Zool. ii. Hym. i. p. 58 (1867).

?*Pompilus spectrum* Kohl, Verh. zool. bot. Ges. Wien, xxxvi. p. 329 (1886).

I think Kohl's name is probably intended for this species. He states, however, that there is no transverse groove on the second ventral segment, whereas in *lunulatus* it is distinctly visible, though in some specimens almost hidden by the apex of the first segment. The hind tibiæ, though feebly spined, are much more distinctly so than is usual in *Pseudagenia*, so that it can only be placed in the genus with doubt.

CRYPTOCHEILUS AUREOSERICEUS Guer. st. AUSTRALASIÆ Sm.

Mygnimia australasiæ Sm. Ann. & Mag. Nat. Hist. (4) xii. p. 259 (1873), ♀.

The Australian form has the apical segment orange-brown clothed with golden pubescence, but does not seem to differ otherwise from Indian specimens.

Hab. Mackay and Cairns, Q. (*Turner*).

CRYPTOCHEILUS ASPASIA Sm.

Mygnimia aspasia Sm. Journ. Proc. Linn. Soc., Zool. iii. p. 157 (1858), ♀.

Salius aspasia Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. p. 45 (1884).

Hab. Aru, New Guinea (*Wallace*); Mackay and Cairns, Q. (*Turner*).

Not previously recorded from Australia. Cameron's remarks on this species are correct (Nova Guinea, vol. i. p. 55).

CRYPTOCHEILUS COMMIXTUS, sp. n.

♀. Clypeus more than twice as broad as long, very sparsely punctured, slightly porrect, the apical margin transverse. Eyes almost touching the base of the mandibles, converging towards the vertex, separated on the vertex by a distance slightly less than the length of the second joint of the flagellum; the posterior ocelli nearly twice as far from the eyes as from each other. Antennæ not very stout, slightly longer than the head, thorax and median segment combined. Pronotum short, very broadly rounded anteriorly, with a delicate median sulcus. Median segment coarsely transversely striated, with a tubercle on each side at the base, nearly twice as broad as long, obliquely sloped posteriorly. Abdomen shining, slightly pruinose; the apical segment rather coarsely punctured, with long sparse fuscous pubescence. Posterior tibiæ serrate, tarsal ungues with one tooth before the middle, not bifid. Cubitus of the hind wing originating just beyond the transverse median nervure; radial cell of the fore wing rounded at apex, second abscissa of the radius shorter than the third, the second cubital cell shorter than the third on the cubital nervure, receiving the first recurrent nervure distinctly before the apex, second recurrent nervure received at about one-third from the base of the third cubital cell.

Orange-ferruginous; head and thorax covered with short golden pile; abdomen black, the apical segment fusco-ferruginous. Wings flavo-hyaline, without a discoidal spot, a narrow fuscous band on the outer margin.

Length 28 mm.

♂. As in the female, but the fuscous marginal band of the wings is broader, the sides of the thorax marked with black, and the clypeus rather longer and not porrect. The second joint of the flagellum is shorter in proportion, being less than half as long again as the third.

Length 19 mm.

Hab. Mackay and Cairns, Q. (*Turner*).

Differs in neuration from *C. aureosericeus* Guér., to which it bears a strong superficial resemblance. The shape of the second cubital cell is very different, also the position of the cubitus of the hind wing.

CRYPTOCHEILUS DARWINII, sp. n. (Plate XXXII. fig. 6, ♀.)

♀. Clypeus very slightly convex, a little broader than long, truncate at the apex, sparsely punctured, the labrum slightly exposed. Eyes almost touching the base of the mandibles, slightly converging towards the vertex, the posterior ocelli a little further from the eyes than from each other. Antennæ slender and very long, about as long as the thorax and abdomen combined; the second joint of the flagellum more than half as long again as the third. Head, thorax, and abdomen without punctures; front produced into a rounded tubercle at the base of each antenna, the tubercles separated by a deep sulcus which nearly reaches the anterior ocellus. Pronotum narrowed and depressed anteriorly, about as long as the breadth on the anterior margin; mesonotum with a longitudinal median furrow and a furrow on each side.

Median segment more than half as long as the breadth at the base, slightly narrowed posteriorly, with a large tubercle on each side near the base, very steeply sloped posteriorly, with an indistinct median sulcus and a few obscure striæ near the apex. Apical segment of the abdomen subtriangular, very narrowly rounded at the apex, and clothed with fulvous pubescence. Posterior tibiæ spined and slightly serrate; spines of the anterior tarsi short. Tarsal ungues long and slender, with one small tooth before the middle of the inner margin, not bifid. Radial cell rounded at the apex; second abscissa of the radius shorter than the third; first recurrent nervure received at two-thirds from the base of the second cubital cell, second before the middle of the third cubital. Cubitus of hind wing interstitial with the transverse median nervure. Orange ferruginous; sternum, pleuræ, scutellum, postscutellum, median segment, first abdominal segment, coxæ, trochanters, and the base of the femora black. Wings flavo-hyaline stained with black at the base and narrowly margined with fuscous at the apex.

Length 29 mm.

♂. Clypeus longer than broad; posterior tibiæ with short spines, not serrate; vertex black. Otherwise as in the female.

Length 14–17 mm.

Hab. Port Darwin (*Turner*). November. 1 ♀, 2 ♂.

Nearest to *C. tuberculatus* Sm., but the antennæ and legs are much longer, and the mesonotum is not black as in that species.

CRYPTOCHEILUS FULVIDORSALIS, sp. n.

♀. Clypeus short, three times as broad at the base as long, very sparsely punctured, the apical margin very feebly and widely emarginate, almost transverse; the labrum slightly exposed. Eyes very slightly convergent towards the vertex; posterior ocelli rather far apart, almost as far from each other as from the eyes. Antennæ moderately long, not very slender; the second joint of the flagellum about half as long again as the third. Head and thorax smooth, subopaque, a short frontal sulcus not reaching the anterior ocellus. Pronotum rounded at the anterior angles, about half as long as the mesonotum, with a delicate, impressed, longitudinal line on the middle. Median segment twice as broad as long, steeply sloped posteriorly, transversely striated, more finely on the dorsal surface than on the posterior slope; a blunt, low tubercle on each side near the base. Abdomen a little longer than the head and thorax combined, slightly pruinose. Posterior tibiæ serrate; tarsal ungues with one tooth, not bifid; legs of moderate length. Radial cell bluntly rounded at the apex, second abscissa of the radius much shorter than the third, second cubital cell receiving the first recurrent nervure at about one-third from the apex, third receiving the second recurrent nervure just before the middle; submediam cell much longer than the median; cubitus of the hind wing originating just beyond the transverse median nervure.

Fulvous orange; scutellum, postscutellum, median segment, basal segment of the abdomen, second and third ventral segments, pleuræ, thorax beneath, coxæ, trochanters, and base of the femora, black. Wings flavo-hyaline, very faintly clouded at the apex.

Length 19 mm.

Hab. Mackay, Q. (*Turner*). December.

Resembles *C. darwinii* in colour, but the legs and antennæ are much shorter. The mesonotum is also much smoother and the median segment is striated.

CRYPTOCHEILUS SATHANAS, sp. n.

♀. Clypeus convex, more than twice as broad as long, opaque and sparsely punctured, the apical margin depressed and very narrowly shining. Inner margins of the eyes almost parallel, slightly diverging towards the clypeus; posterior ocelli as far from each other as from the eyes, the eyes touching the base of the mandibles. Antennæ moderately stout, as long as the thorax and median segment combined; the second joint of the flagellum more than half as long again as the third. Head opaque, almost smooth, a short longitudinal sulcus between the antennæ. Pronotum more than half as long as the mesonotum, the anterior angles strongly rounded. Thorax opaque; the mesonotum with an impressed, longitudinal, median line which is continued on the base of the scutellum. Median segment nearly twice as broad at the base as long, vertically truncate posteriorly, rectangular, with a deep median sulcus, indistinctly transversely striated on the apical half. Abdomen opaque, pruinose, the apical segment deflexed, rounded at the apex. Anterior tarsi with very short spines on the basal joint, posterior tibiæ serrate; tarsal ungues with one tooth on the inner margin. Radial cell pointed at the apex; first recurrent nervure received at two-thirds from the base of the second cubital cell, second at the middle of the third cubital cell; second abscissa of the radius shorter than the third; cubitus of the hind wing originating before the transverse median nervure.

Entirely black: wings dark fuscous without coloured reflections.

Length 25 mm.

Hab. Port Darwin (*Turner*). November.

CRYPTOCHEILUS ERYTHROTHORAX, sp. n.

♀. Clypeus short, much broader than long, slightly convex, the apical margin very feebly and widely emarginate, almost transverse. Eyes scarcely separated from the base of the mandibles, converging a little towards the vertex, where they are separated by a distance about equal to the length of the third joint of the flagellum; posterior ocelli considerably further from the eyes than from each other. Antennæ rather slender, as long as the head, thorax and median segment combined; the second joint of the flagellum a little longer than the third. Pronotum narrowed and rounded anteriorly, the posterior margin arched, more than half as long as the mesonotum. Median segment as long as broad, steeply sloped posteriorly, with a median sulcus, the apex and the posterior slope transversely striated. Abdomen subpetiolate, fusiform, pruinose, with a transverse groove on the second ventral segment. Posterior tibiæ with a ridge above, spinose, not serrate; tarsal ungues with a tooth, not bifid; anterior tarsi without a comb; the tarsi long. Second abscissa of the radius almost equal to the third; radial cell rather blunt at apex, not truncate or rounded, first recurrent nervure received just before the middle of the second cubital cell, second at the middle of the third cubital cell; submedian cell longer than the median; cubitus of the hind wing interstitial with the transverse median nervure.

Black; antennæ, legs, pleuræ, thorax, and median segment above ferruginous red; extreme apex of the clypeus and base of the mandibles fusco-ferruginous. Wings hyaline, crossed by two broad fuscous bands, one on the basal nervure, the other from the radial cell; nervures black.

Length 12 mm.

♂. As in the female, but the legs are black excepting the anterior tibiæ and tarsi, and the median segment is not striated.

Hab. Mackay and Kuranda, Q. (*Turner*). December to May.

This belongs to a rather distinct group, being without serrations on the hind tibiæ. It is found occasionally running on the stem of *Eucalyptus* in proximity to the Reduviid bug *Entomocoris decoratus* Stål, which it closely resembles when the wings are closed.

CALOPOMPILUS TENULUS, sp. n.

♀. Clypeus about three times as broad as long, slightly convex, the anterior margin almost transverse. Eyes reaching to the base of the mandibles, converging towards the vertex, where they are separated by a distance equal to the length of the second and two-thirds of the third joint of the flagellum; posterior ocelli a little further from the eyes than from each other. Pronotum short, the posterior margin strongly angled in the middle; median segment convex, as long as broad, not truncate posteriorly, with a shallow median sulcus not reaching the apex. Abdomen slender, fusiform, subpetiolate; the second ventral segment with a transverse groove. Posterior tibiæ strongly spinose, with a ridge; anterior tarsi without a comb; tarsal ungues with one tooth. Second abscissa of the radius nearly half as long again as the third; first recurrent nervure received at the middle of the second cubital cell, second at one-third from the base of the third; submedian cell longer than the median; cubitus of the hind wing interstitial with the transverse median nervure. Opaque, the abdomen slightly shining.

Black; joints 2–6 of the flagellum orange-yellow; anterior tibiæ pale testaceous brown. Wings hyaline, crossed by two pale fuscous bands, one on the basal nervure, the other from the radial cell, the apex also pale fuscous.

Length 9–10 mm.

Hab. Mackay, Q. (*Turner*).

This species has the form of a *Pseudagenia*, from which it is removed by the spinose posterior tibiæ. The shape of the median segment is very different to typical *Calopompilus*.

CALOPOMPILUS RAPTOR Sm.

Pompilus raptor Sm. Trans. Ent. Soc. London, (3) i. p. 54 (1862), ♀.

Priocnemis polydorus Sm. Trans. Ent. Soc. London, 1868, p. 246, ♀.

Pompilus pollens Kohl, Verh. zool.-bot. Ges. Wien, xxxvi. p. 332 (1886), ♀.

As noticed by Kohl this species is somewhat intermediate between *Anoplius* and *Cryptocheilus*, having a transverse groove on the second ventral segment.

CALOPOMPILUS PICTIPENNIS Sm.

Pompilus pictipennis Sm. Cat. Hym. B. M. iii. p. 165 (1855), ♀.

Pompilus pachycerus Kohl, Verh. zool.-bot. Ges. Wien, xxxvi. p. 333 (1886), ♀.

Hab. Victoria.

CALOPOMPILUS MOLESTUS Sm.

Pompilus molestus Sm. Trans. Ent. Soc. London, (3) i. p. 54 (1862).

Hab. Melbourne to Brisbane.

Specimens from Stradbroke Island, Q., differ in having all the tibiæ ferruginous and the third abscissa of the radius longer than the second.

CALOPOMPILUS DEFENSOR Sm.

Priocnemis defensor Sm. Trans. Ent. Soc. London, 1868, p. 245, ♀.

Pompilus fulvipennis Sm. Descr. n. sp. Hym. p. 151 (1879), ♂ ♀.

I cannot see that *fulvipennis* is anything but a small specimen of *defensor*.

Calopompilus Ashm. is in my opinion a good genus, unless indeed it has to sink under *Hemipogonius* Sauss. The present species is not a typical example of the genus, as the cubitus of the hind wing originates a little before the transverse median nervure and the submedian cell of the fore wing is very little longer than the median. The male has no transverse groove on the second ventral segment, but this character seems to be common to the males of this genus. The differences noticed in neuration do not seem to be constant, for in some specimens, including the type, the cubitus of the hind wing is very nearly interstitial with the transverse median nervure.

CALOPOMPILUS VELOX Sm.

Pompilus velox Sm. Trans. Ent. Soc. London, 1868, p. 240, ♂.
Pompilus ahasuerus Kohl, Verh. zool.-bot. Ges. Wien, xxxvi p. 333 (1886), ♂.

I think this is a *Calopompilus*, though it is not quite certain, the female being still unknown.

CALOPOMPILUS ANTENNALIS Sm.

Pompilus antennalis Sm. Cat. Hym. B. M. iii. p. 161 (1855), ♂.

♀. Clypeus about three times as broad as long, the anterior margin not quite transverse, very feebly and widely emarginate, the labrum slightly exposed. Eyes very sligitly convergent towards the clypeus, separated on the vertex by a distance about equal to the length of the first and two-thirds of the second joint of the flagellum; the posterior ocelli a little further from the eyes than from each other. Front very feebly raised at the base of the antennæ, marked with a short and shallow sulcus; third joint of the flagellum a little shorter than the second. Pronotum strongly rounded anteriorly, the posterior margin rather feebly arched, shorter than the mesonotum. Median segment fully twice as broad as long, with a median sulcus, abruptly truncate posteriorly. Abdomen subsessile; the second ventral segment with a transverse groove. Posterior tibiæ spinose, with a ridge, not serrate; anterior tarsi without a comb, tarsal ungues with one tooth. Second abscissa of the radius very little longer than the third; first recurrent nervure received at two-thirds from the base of the second cubital cell, second at the middle of the third cubital cell; submedian cell longer than the median; cubitus of hind wing interstitial with the transverse median nervure. Opaque, pruinose.

Black; flagellum orange-yellow; mandibles, labrum, anterior tarsi and apical joints of all the tarsi fusco-ferruginous; spurs of the tibiæ whitish; a band of white pile on the apical margin of the five basal abdominal segments. Wings fuscous, a subhyaline band beyond the third transverse cubital nervure.

Length 14 mm.

Hab. Mackay, Q. (*Turner*).

Specimens from Cumberland, N.S.W., have the second joint of the flagellum nearly half as long again as the third, the apical joint black, the second abscissa of the radius half as long again as the third.

CALOPOMPILUS NUGENTI, sp. n.

♀. Clypeus very short and broad, transverse at the apex, the labrum exposed. Head broader than long, the front not raised at the base of the antennæ, rather flat, smooth and shining. Eyes almost touching the base of the mandibles, their inner margins almost parallel, separated on the vertex by a distance equal to the length of the three basal joints of the flagellum combined; the posterior ocelli a little further from the eyes than from each other. Antennæ rather stout, scarcely as long as the thorax and median segment combined; the second and third joints of the flagellum about equal in length, the fourth a little longer. Pronotum about one-third shorter than the mesonotum, slightly rounded anteriorly, more than twice as broad as long, the posterior margin very feebly arched. Median segment about half as broad again as long, with a shallow median sulcus, vertically truncate posteriorly, the face of the truncation coarsely transversely striated. Abdomen subsessile, fusiform. Tarsal ungues with one tooth; anterior tarsi without a comb; posterior tibiæ spinose, with a distinct ridge. Second abscissa of the radius nearly half as long again as the third; first recurrent nervure received at the middle of the second cubital cell, second at the middle of the third cubital cell; submedian cell longer than the median; cubitus of hind wing interstitial with the transverse median nervure. Opaque, pruinose.

Black; antennæ orange-yellow; apex of clypeus, labrum, mandibles, tegulæ and legs fusco-ferruginous. Wings subhyaline, crossed by a fuscous band on the basal nervure and by another, very broad, from the radial cell, the apex pale fuscous. Three basal dorsal segments of the abdomen with narrow bands of silver pile on the apical margin. Spines of the tibiæ whitish.

Length 13 mm.

Hab. Kuranda, Q. (*Turner*). December.

Specimens from Mackay have the legs black, except the anterior tibiæ and tarsi.

CALICURGUS (?) BASIPENNIS, sp. n.

♀. Clypeus short, broadly truncate at the apex. Eyes almost touching the base of the mandibles, their inner margins slightly curved, separated on the vertex by a distance equal to the combined length of the two basal joints of the flagellum; posterior ocelli a little nearer to the eyes than to each other. Antennæ longer than the thorax and median segment combined; the second joint of the flagellum half as long again as the third. Front very slightly raised at the base of the antennæ, with a short median sulcus. Pruinose and slightly shining. Head not very flat. Pronotum only a little shorter than the mesonotum, a little narrower than the head, rounded at the angles, the posterior margin scarcely arched. Median segment about half as broad again as long, obliquely deflexed near the apex. Abdomen subsessile, fusiform; the second ventral segment with a feeble transverse groove. Posterior tibiæ spinose, anterior tarsi without a comb; tarsal ungues bifid. Second abscissa of the radius more than half as long again as the third; the second cubital cell higher than long, much shorter than the third on the cubital nervure; first recurrent nervure received beyond two-thirds from the base of the second cubital cell, second at the middle of the third cubital cell; submedian cell just longer than the median; cubitus of the hind wing originating well beyond the transverse median nervure.

Black, with a little very fine greyish pile; mandibles fusco-ferruginous, spines of the tibiæ whitish. Wings flavohyaline at the base, as far as the basal nervure on the fore wing, thence hyaline, crossed by two almost confluent pale fuscous bands; nervures fulvous at the base, fuscous from the basal nervure.

Length 9 mm.

Hab. Mackay, Q. (*Turner*).

The neuration differs somewhat from typical *Calicurgus.*

CALICURGUS (?) BASIPENNIS st. AGNATUS, st. n.

♀. Very near *C. basipennis,* from which it differs only in the following points: the median segment is shorter and more steeply sloped, the tibiæ, tarsi, and second joint of the flagellum are ferruginous, and the colours of the wings darker. The third abscissa of the radius is longer, being nearly or quite as long as the second.

Hab. Kuranda, Q. (*Turner*). November to February.

This is almost certainly a mere geographical form of *basipennis.*

FERREOLOMORPHA ARTEMIS, sp. n.

♀. Clypeus extremely short and broad, transverse, the labrum exposed as long as the clypeus, broadly rounded at the apex. Head longer than broad, slightly convex, the front strongly raised and pointed at the base of the antennæ; eyes very narrowly separated from the base of the mandibles, the inner margins parallel; posterior ocelli scarcely further from the eyes than from each other. Antennæ a little longer than the thorax and median segment combined; the second joint of the flagellum about one-fourth shorter than the third joint. Pronotum a little longer than the mesonotum, nearly as broad as the head, the sides parallel, distinctly broader than long, the posterior margin very feebly arched, almost transverse. Median segment half as broad again as long, vertically truncate posteriorly, with a well-marked median sulcus on the dorsal surface. Abdomen subsessile, the sides almost parallel; second ventral segment with a transverse groove. Opaque, with very short and rather irregularly distributed brownish pile, thickest on the median segment. Tarsal ungues with one tooth; anterior tarsi without a comb; posterior tibiæ spinose but not serrate, not quite cylindrical. Second abscissa of the radius as long as the third, recurrent nervures received at the middle of the second and third cubital cells; submedian cell equal in length to the median; cubitus of the hind wing in the type originating just beyond the transverse median nervure, in another specimen interstitial with it. Wings rather short, when closed not reaching the apex of the abdomen.

Black; antennæ (except the three apical joints) orange-yellow, a very narrow band of silver pile on the apical margin of the three basal abdominal segments. Wings fusco-hyaline, a flavo-hyaline lunule at the apex of the radial and third cubital cells, extending about half-way to the outer margin beyond the third transverse cubital nervure.

Length 8–11 mm.

Hab. Mackay, Q. (*Turner*).

I think I am correct in assigning this species to Ashmead's genus *Ferreolomorpha*, with which the neuration agrees well, but his description is somewhat brief.

ANOPLIUS AHRIMANES, sp. n.

♀. Clypeus short and very broad, transverse at the apex, slightly convex. Eyes separated from the base of the mandibles by a distance considerably less than the length of the first joint of the flagellum, their inner margins slightly sinuate and converging towards the vertex, where they are separated by a distance slightly exceeding the length of the third joint of the flagellum; posterior ocelli as far from each other as from the eyes. Antennæ as long as the head, thorax, and median segment combined; the second joint of the flagellum nearly half as long again as the third. Front not raised into tubercles at the base of the antennæ, the frontal sulcus very short. Head not flattened, moderately thick. Pronotum a little more than half as long as the mesonotum, rounded at the anterior angles, the arch of the posterior margin not angulate in the middle. Median segment subtuberculate on the sides before the stigma and with a blunt lateral tubercle before the posterior angles, nearly twice as broad as long, with a deep median sulcus and almost vertically truncate posteriorly. Thorax finely aciculate; median segment opaque. Abdomen subsessile, smooth and slightly shining, elongate fusiform; the apical segment long and narrow, finely punctured; second ventral segment without a transverse groove, but not quite even, showing a very obscure transverse depression. Tarsal ungues with one tooth; anterior tarsi with a long comb; posterior tibiæ spined, not serrate, almost cylindrical. Third cubital cell very short on the radial nervure, only one-fifth of the length of the second, but nearly as long as the second on the cubital nervure; first recurrent nervure received close to the apex of the second cubital cell, second beyond the middle of the third cubital cell; transverse median nervure interstitial with basal nervure; cubitus of hind wing interstitial with the transverse median nervure.

Black; the orbits of the eyes narrowly whitish grey, not reaching the summit. Wings black.

Length 24 mm.

Hab. Townsville, Q. (*Dodd*).

This species approaches the genus *Cryptocheilus*.

ANOPLIUS ATAVUS, sp. n. (Plate XXXII. fig. 7, ♀.)

♀. Clypeus transverse at the apex, short, more than twice as broad as long. Eyes separated from the base of the mandibles by a distance about equal to the length of the first joint of the flagellum, their inner margins converging towards the vertex, where they are separated by a distance about equal to the length of the second joint of the flagellum; posterior ocelli a little further from the eyes than from each other. Front not raised at the base of the antennæ, which are not very stout, a little longer than the thorax and median segment combined; second joint of the flagellum long, nearly as long as the third and fourth combined. Pronotum broadly arched posteriorly, the apex of the arch forming a slight angle, the sides almost parallel, the anterior angles scarcely rounded. Median segment shorter than the scutellum, about twice as broad as long, with a deep median sulcus, steeply and obliquely sloped posteriorly. Abdomen almost smooth, the three basal segments slightly shining; second ventral segment without a transverse furrow. Second abscissa of the radius half as long again as the third; second cubital cell receiving the first recurrent nervure near the apex, third receiving the second recurrent nervure near the middle; transverse median nervure interstitial with the basal; cubitus of hind wing interstitial with the transverse median nervure. Tarsal ungues with one tooth; anterior tarsi with a comb.

Black; head, prothorax, and mesonotum closely covered with white pile, a narrow line across the vertex behind the ocelli without pile. Wings dark fuscous.

Length 22 mm.

Hab. Strelley River, N.W. Australia (*H. M. Giles*).

The white pile renders this species very conspicuous.

Anoplius senex, sp. n. (Plate XXXII. fig. 8, ♀.)

♀. Clypeus slightly porrect, transverse at the apex, more than twice as broad as long. Eyes separated from the base of the mandibles by a distance not quite equal to the length of the first joint of the flagellum, their inner margins converging towards the vertex, where they are separated by a distance not quite equal to the length of the second joint of the flagellum. Antennæ a little longer than the thorax and median segment combined; the second joint of the flagellum more than half as long again as the third. Head moderately thick; a very faint frontal sulcus reaching the anterior ocellus. Pronotum scarcely more than half as long as the mesonotum, the anterior angles slightly rounded; the posterior margin arched, without an angle. Median segment more than half as broad again as long, with a deep median sulcus, almost vertically truncate posteriorly, sloped gradually to the base of the truncation. Abdomen subsessile, the second ventral segment without a transverse sulcus. Fore tarsi with a long comb; tarsal ungues with one tooth, not bifid. Second abscissa of the radius very little longer than the third; first recurrent nervure received close to the apex of the second cubital cell, second received at the middle of the third cubital cell; transverse median nervure almost interstitial with the basal nervure;

cubitus of the hind wing interstitial with the transverse median nervure.

Black, covered with whitish-grey pile; a transverse line on the vertex, the front of the mesonotum, the apical abdominal segment, and the extreme apex of the clypeus bare. Wings subhyaline, with a rather broad fuscous band on the outer margin.

Length 17 mm.

Hab. Victoria (*French*).

Allied to *A. atavus*, but differs in the shape of the cubital cells, the colour of the wings, and the much greater extent of the pile.

ANOPLIUS LABILIS Sm.

Pompilus labilis Sm. Descr. n. sp. Hym. p. 151 (1879).

Hab. Townsville, Q. (*Dodd*); Nicol Bay, W. A. (*Dr. Clement*).

ANOPLIUS DODDI, sp. n.

♀. Clypeus about twice as broad as long, rounded at the sides, almost transverse at the apex. Eyes almost touching the base of the mandibles, their inner margins converging towards the vertex, where they are separated by a distance equal to three-fourths of the length of the second joint of the flagellum; posterior ocelli a little nearer to the eyes than to each other. Front not produced into tubercles at the base of the antennæ; second joint of the flagellum long, more than half as long again as the third joint. Pronotum short, narrower than the head, the posterior margin strongly arched, with a slight angle at the apex of the arch. Median segment short, twice as broad as long, with a faint median sulcus, abruptly truncate posteriorly. Second ventral segment of the abdomen without a transverse groove. Tarsal ungues bifid; posterior tibiæ spined, cylindrical; anterior tarsi with a long comb. Third abscissa of the radius very short, no longer than the first; third cubital cell as long as the second on the cubitus, receiving the second recurrent nervure at two-thirds from the base; first recurrent nervure received at two-thirds from the base of the second cubital cell; transverse median nervure interstitial with the basal nervure; cubitus of the hind wing interstitial with the transverse median nervure.

Opaque black, with silvery grey pubescence on the clypeus, face, cheeks, continued along the posterior margin of the head, posterior margin of the pronotum, coxæ, pleuræ, posterior margin of the mesonotum, scutellum, anterior and posterior angles of the median segment, and base of the first abdominal segment; a band of grey pile narrowly interrupted in the middle at the base of abdominal segments 2–5. Wings hyaline, broadly fuscous along the basal nervure; another fuscous band beyond the radial cell, very broad but not quite touching the apex and continued on the hind wing; a fuscous patch occupying the radial and third cubital cells and extending into the second cubital and discoidal cells.

Length 9 mm.

Hab. Townsville, Q. (*Dodd*).

ANOPLIUS AMŒNULUS, sp. n.

♀. Clypeus about three times as broad as long, transverse at the apex. Eyes almost touching the base of the mandibles, their inner margins almost parallel, slightly curved towards the vertex, where they are separated by a distance equal to the length of the second joint of the flagellum; posterior ocelli about half as far again from the eyes as from each other. Antennæ as long as the head, thorax, and median segment combined; the second joint of the flagellum half as long again as the third and twice as long as the fourth. Pronotum depressed, shorter than the mesonotum, the posterior margin with a slight angle at the apex of the arch. Median segment a little broader than long, with a faint median sulcus at the base, obliquely sloped posteriorly. Abdomen fusiform; second ventral segment without a groove. Posterior tibiæ cylindrical, spinose; tarsal ungues with one tooth; anterior tarsi with a few short spines on the basal joint. Second abscissa of the radius nearly twice as long as the third; first recurrent nervure received near the apex of the second cubital cell, second close to the middle of the third cubital cell; submedian cell a little longer than the median; cubitus of hind wing interstitial with the transverse median nervure.

Black; with a transverse band of cinereous pile at the base of the second and third dorsal abdominal segments; silvery pile on the clypeus, sides of the postscutellum, coxæ, and angles of the median segment. Wings fuscous, an obscure band outside the third transverse cubital a little paler.

Length 13 mm.

Hab. Mackay, Q. (*Turner*). March.

This differs from *nubilipennis* Sm. in the structure of the posterior tibiæ as well as in other details. *A. cinereus* Fabr., a common Queensland species, has paler wings with a fuscous margin, and is a smaller species.

ANOPLIUS SERICOPS, sp. n.

♀. Clypeus about twice as broad as long, widely emarginate at the apex, the labrum exposed. Eyes separated from the base of the mandibles by a distance not exceeding half the length of the first joint of the flagellum, their inner margins nearly parallel, slightly curved towards the vertex, where they are separated by a distance about equal to the length of the third joint of the flagellum; the posterior ocelli about as far from each other as from the eyes. Front not raised into tubercles at the base of the antennæ; the second joint of the flagellum scarcely longer than the third. Pronotum as long as the mesonotum, narrower than the head, the arch of the posterior margin with an obtuse angle at the apex. Median segment distinctly broader than long, with a rather obscure median sulcus, truncate posteriorly. Abdomen elongate fusiform; second ventral segment without a transverse groove. Tarsal ungues bifid; posterior tibiæ spined; comb of anterior tarsi very short. Radial cell short, less than twice as long as broad, first abscissa of the radius nearly twice as long as the second; third cubital cell petiolate, the petiole occupying about one-fourth of the length of the second transverse cubital nervure; transverse median nervure almost interstitial with the basal nervure; first recurrent nervure received at two-thirds from the base of the second cubital cell, second at the middle of the third cubital cell; cubitus of hind wing interstitial with the transverse median nervure.

Black, opaque, with cinereous pile on a broad band on the anterior margin of the pronotum and on the base of each abdominal segment from the second to the fifth inclusive; clypeus and face with silvery pile, the pile on the coxæ and thorax beneath grey. Wings fuscous, with a darker band at the apex.

Length 13-15 mm.

Hab. Mackay, Q. (*Turner*).

This is the only Australian species, so far as I know, in which the third cubital cell is petiolate.

ANOPLIUS NIGRICORNIS Fabr.

Sphex nigricornis Fabr. Syst. Ent. p. 351 (1775), ♀.

Pompilus diversus Sm. Trans. Ent. Soc. London, 1868, p. 244, ♀. (*Nec* Smith 1873, *nec* Dahlbom.)

Pompilus bos Dalla Torre, Cat. Hym. viii. p. 277 (1897).

The sculpture on the median segment is more distinct in recent specimens, which are also much larger, the Fabrician type being only 8 mm. in length, but I do not think they are specifically distinct.

ANOPLIUS ELATUS Sm.

Pompilus elatus Sm. Journ. Linn. Soc., Zool. viii. p. 82 (1864), ♀.

Hab. Morty (*Wallace*); Mackay, Q. (*Turner*).

I identify this species with some doubt, but my specimens answer well to the short description.

ANOPLIUS (EPISYRON) ORIENTALIS Cam.

Ceropales orientalis Cam. Mem. Manch. Lit. Phil. Soc. (4) iv. p. 432 (1891), ♂.

Pompilus orientalis Bingh. Fauna Brit. India, Hym. i. p. 157 (1897), ♂.

Hab. Mackay and Kuranda, Q. (*Turner*).

Though the male is not uncommon, I do not know the female.

ANOPLIUS (EPISYRON) JUBILANS, sp. n.

♂. Clypeus about twice as broad as long, slightly narrowed to the apex which is transverse; the labrum exposed, as long as the clypeus and narrowly truncate at the apex. Eyes separated from the base of the mandibles by a distance equal to about half the length of the scape, their inner margins slightly diverging towards the vertex, where they are separated by a distance equal to the length of the second and third joints of the flagellum combined. Antennæ very stout, a little longer than the thorax and median segment combined, tapering to the apex, the joints arcuate beneath; scape very short, little more than half as long as the second joint of the flagellum, which is equal in length to the third. Pronotum short, depressed, rounded anteriorly, the posterior margin feebly arched. Median segment convex, as long as broad, longer than the mesonotum, very gradually sloped posteriorly. Abdomen subpetiolate, elongate fusiform; second ventral segment without a transverse sulcus. Tarsal ungues bifid; legs slender, a few minute spines on the posterior tibiæ. Second abscissa of the radius twice as long as the third, the second cubital cell a little longer than the third on the cubital nervure; first recurrent nervure received at two-thirds from the base of the second cubital cell, second at the middle of the third cubital cell; submedian cell slightly longer than the median; cubitus of the hind wing originating before the transverse median nervure. Opaque, pruinose.

Black; the antennæ (except the three apical joints) bright orange; labrum, sides and base of the clypeus, scape beneath, and the face as high as the base of the antennæ continued for a short distance on the inner margins of the eyes, creamy yellow; posterior margin of the pronotum, a transverse band on each side at the base of the second dorsal abdominal segment, another shorter and narrower on each side near the base of the third segment, the spines of the tibiæ, and a line near the base of the posterior tibiæ, white; anterior tarsi and tibiæ testaceous brown. Bands of greyish pile at the apex of the abdominal segments, very narrow on the first three, a little broader on the others. Thorax and median segment with patches of silvery pile. Wings hyaline, margined with pale fuscous, a pale fuscous band from the radial cell crossing the third cubital cell.

Length 11 mm.

Hab. Mackay, Q. (*Turner*). January.

I place this species in the subgenus *Episyron* with some doubt, as it is very difficult to separate the males of that group from those of *Calopompilus*.

ANOPLIUS (EPISYRON) LEPIDOHIRTUS, sp. n.

♀. Clypeus very slightly convex, nearly three times as broad as long, the apical margin transverse. Eyes very narrowly separated from the base of the mandibles, slightly convergent towards the vertex, where they are separated by a distance about equal to the length of the second joint of the flagellum; posterior ocelli a little further from each other than from the eyes. Antennæ about as long as the head, thorax, and median segment combined; the second joint of the flagellum nearly twice as long as the third. A very delicate frontal sulcus, not reaching the anterior ocellus. Pronotum depressed, short, narrowed anteriorly and strongly rounded at the angles, the posterior margin arched not angular at the apex. Median segment short, more than twice as broad as long, steeply sloped posteriorly, the median sulcus almost obsolete. Abdomen subsessile, elongate fusiform; second ventral segment without a groove. Tarsal ungues bifid; anterior tarsi with a comb. Third cubital cell very short, only one-third of the length of second on the radial nervure and only a little more than half as long as the second on the cubital nervure; first recurrent nervure received beyond the middle of the second cubital cell, second close to the middle of the third cubital cell; transverse median nervure interstitial with the basal nervure; cubitus of hind wing originating just before the transverse median nervure, almost interstitial.

Black, opaque; a very narrow line near the middle of the inner orbits of the eyes, the outer orbits very narrowly, the posterior margin of the pronotum, and a transverse band very narrow in the middle at the base of the third dorsal abdominal segment, dull ochreous; clypeus and face clothed with silvery pubescence, apex of the median segment and the whole of the first dorsal abdominal segment covered with close-lying, coarse, bluish-grey shining pubescence. Wings pale fusco-hyaline, the outer margin broadly fuscous.

Length 14 mm.

♂. Clypeus rather longer, the labrum slightly exposed, median segment longer and less sharply sloped; basal half of the flagellum ochreous beneath; band on the third abdominal segment white.

Length 9 mm.

Hab. Mackay, Q. (*Turner*). February to May.

This is probably only a geographical form of *papuensis* Sm., from which it differs in the much broader clypeus and face. In *papuensis* the anterior margin of the clypeus is yellow and there is a yellow line on the posterior margin of the mesonotum; the second recurrent nervure is also received nearer to the apex of the third cubital cell.

ANOPLIUS (EPISYRON) LIMPIDUS, sp. n.

♀. Clypeus transverse at the apex, more than twice as broad as long. Eyes very narrowly separated from the base of the mandibles, their inner margins slightly curved and converging towards the vertex, where they are separated by a distance equal to two-thirds of the length of the second joint of the flagellum; posterior ocelli a little further from the eyes than from each other. Antennæ as long as the head, thorax, and median segment combined; the second joint of the flagellum about half as long again as the third. Pronotum depressed anteriorly and rounded at the angles, the hind margin arched, with a slight angle in the middle. Median segment convex, obliquely sloped posteriorly, about twice as broad as long, the median sulcus almost obsolete. Abdomen subpetiolate, elongate ovate. Tarsal ungues bifid, anterior tarsi with a comb. Third abscissa of the radius half as long again as the second; first recurrent nervure received near the apex of the second cubital cell, second beyond the middle of the third cubital cell; transverse median nervure interstitial with the basal nervure; cubitus of the hind wing originating just before the transverse median nervure.

Opaque, pruinose; a narrow frontal sulcus reaching the anterior ocellus; second ventral segment without a transverse groove.

Black; the posterior margin of the pronotum dull luteous; antennæ, femora, tibiæ, and tarsi ferruginous; the apex of the median segment with shining silvery pubescence, an obscure transverse band of dark grey pile at the base of the third abdominal segment and a spot of the same at the apical angles of the second. Wings hyaline, faintly tinged with yellow, crossed by two fuscous bands, one on the basal nervure, the other, very broad, from the radial cell.

Length 11 mm.

♂. Clypeus at the apex pale luteous; first dorsal segment of the abdomen covered almost to the apex with rather long silvery pubescence, a white transverse band much narrowed in the middle at the base of the third segment. Abdomen somewhat compressed laterally.

Length 8 mm.

Hab. Kuranda near Cairns, Q. (*Turner*). January and February.

ANOPLIUS (EPISYRON) KURANDENSIS, sp. n.

♀. Clypeus short, more than three times as broad as long, transverse at the apex. Eyes almost touching the base of the mandibles, the inner margins parallel near the base, curved towards the vertex, where they are separated by a distance about equal to the length of the two basal joints of the flagellum combined; posterior ocelli a little further from the eyes than from each other. Antennæ longer than the thorax and median segment combined; the second joint of the flagellum more than half as long again as the third. Pronotum short, depressed, rounded at the angles, the posterior margin broadly arched. Median segment deflexed, rounded posteriorly, about as long as broad. Abdomen small, narrowly fusiform. Tarsal ungues bifid; anterior tarsi almost without a comb, only one or two spines on the basal joint; posterior tibiæ spined. Second abscissa of the radius about three times as long as the third, first and third about equal in length; second cubital cell longer on the cubitus than the third; first recurrent nervure received at two-thirds from the base of the second cubital cell, second beyond the middle of the third cubital cell; transverse median nervure interstitial with the basal nervure; cubitus of hind wing originating just before the transverse median nervure.

Opaque black; the apex of the clypeus broadly, but deeply emarginate from the base in the middle, the inner orbits of the eyes, posterior margin of the pronotum, a spot on the posterior margin of the mesonotum, a spot on the tegulæ, and a broad transverse band at the base of the third dorsal segment of the abdomen, ochreous yellow; tibiæ, tarsi, five basal joints of the antennæ, and the base of the mandibles dull ferruginous brown. Wings subhyaline, slightly iridescent, broadly pale fuscous at the apex of the anterior pair; nervures testaceous brown. First dorsal segment clothed with greyish pubescence.

Length 6-8 mm.

Hab. Kuranda, Q. (*Turner*). January and February.

Two specimens.

APORUS CINGULATUS Fabr.

Sphex cingulata Fabr. Syst. Ent. p. 250 (1775).

Aporus cingulatus Sm. Cat. Hym. B. M. iii. p. 175 (1855).

Hab. Mackay to Cooktown, Q. (*Turner*).

The second abscissa of the radius is no longer than the first in the typical Queensland form, but in specimens from Victoria and South Australia it is much longer. As I cannot detect any other appreciable difference I consider it better to treat this as a geographical variation, though it is quite possible that it may prove to be distinct. Southern specimens are usually larger than the typical form. This is probably the species described by Kohl as *Pompilus apantelus*, but his description is very poor.

APORUS NIGROCINERASCENS, sp. n.

♀. Mandibles bidentate; clypeus broadly truncate at the apex, convex, nearly three times as broad as long, the labrum exposed. Eyes almost parallel on the inner margin, a little nearer together on the vertex than on the clypeus; the ocelli in a very broad triangle, the posterior pair rather further from each other than from the eyes. Head very thin; pronotum not very short, depressed and narrowed anteriorly. Median segment broader than long, obliquely sloped posteriorly, slightly shining, with an obscure median sulcus and a small triangular depression at the base, the posterior angles bluntly produced. Abdomen subsessile; the first segment longer and narrower than the second, broadened from the base; apical segment elongate, pointed, sparsely punctured. Second joint of the flagellum more than half as long again as the third. Anterior tarsi with a long comb; posterior tibiæ spinose; tarsal ungues toothed but without a comb. Second abscissa of the cubitus twice as long as the first; radial cell broad, not more than twice as long as broad; first recurrent nervure received a little before the middle of the second cubital cell, the second near the apex; cubitus of hind wing interstitial with the transverse median nervure.

Black, with short obscure cinereous pubescence on the front, clypeus, margins of the pronotum very narrowly, posterior slope of median segment and apical margin of two basal abdominal segments, the first broadly, the second narrowly; apical segment fuscous. Wings hyaline, broadly margined with pale fuscous at the apex.

Length 11 mm.

♂. Very similar, but the emargination of the eyes which is very feeble in the female is rather more distinct in the male. The first dorsal segment of the abdomen is entirely covered with cinereous pubescence.

Length 6 mm.

Hab. Mackay, Q. (*Turner*).

APORUS IMMITIS, sp. n.

♀. Clypeus transverse at the apex, about three times as broad as long. Eyes very widely and shallowly emarginate, a little nearer together on the vertex than on the clypeus; posterior ocelli as far from each other as from the eyes. Antennæ a little longer than the thorax and median segment combined; the third joint of the flagellum long, nearly as long as the second. Pronotum depressed anteriorly, about twice as broad as long, the posterior margin very feebly arched. Median segment with the sides parallel, rather broader than long, sloped posteriorly, but not truncate. Abdomen subsessile, rather slender, the apical segment pointed. Posterior tibiæ spinose, anterior tarsi with a rather feeble comb. Radial cell short and rather narrow, about three times as long as the greatest breadth; the second cubital cell arched towards the radial nervure, the second abscissa of the radius not more than half as long as the first; both recurrent nervures received by the second cubital cell, the first very near the base, the second close to the apex; cubitus of the hind wing originating just beyond the transverse median nervure, almost interstitial with it.

Black, with cinereous grey pubescence as follows: on the clypeus, front, margins of the pronotum, angles of the scutellum and median segment, mesopleuræ, and a broad transverse band on the apical margin of the four basal segments of the abdomen; mandibles fusco ferruginous at the apex. Wings hyaline at the base, fusco-hyaline towards the apex and along the nervures.

Length 8 mm.

Hab. Mackay, Q. (*Turner*).

Differs from *cingulatus* Fabr. in the slenderer antennæ, the different proportion of the joints of the flagellum, the shorter pronotum, the more gradual slope of the median segment, the shorter second abscissa of the radius, the narrower radial cell, and the much greater distance between the recurrent nervures.

APORUS ACER, sp. n.

♀. Clypeus about three times as broad as long, slightly convex; the anterior margin very feebly and widely emarginate, almost transverse. Eyes nearly parallel on the inner margin; the posterior ocelli almost as far from each other as from the eyes.

Second and third joints of the flagellum of about equal length. Pronotum depressed anteriorly, the posterior margin broadly arched. Median segment obliquely sloped posteriorly, the dorsal surface before the oblique slope about twice as broad as long. Anterior tarsi with a few short spines; posterior tibiæ spinose; tarsal ungues with one tooth. Second abscissa of the radius as long as the first, the two recurrent nervures received far apart near the base and apex of the second cubital cell, radial cell rather broad. Cubitus of hind wing originating far beyond the transverse median nervure. Transverse median nervure of fore wing joining the median nervure before the origin of the basal nervure.

Black, with cinereous pubescence on the clypeus, front, anterior angles and posterior slope of the median segment, and a broad transverse band on the apical margin of each of the four basal abdominal segments. Wings hyaline, with a narrow fuscous band crossing the wing at the basal nervure and another broad band from the radial cell; hind wing pale fuscous at the apex.

Length 9 mm.

Hab. Mackay, Q. (*Turner*). October.

Very near *A. immitis*, but differs considerably in neuration and in the colour of the wings.

APORUS TENELLUS, sp. n.

♀. Mandibles bidentate; clypeus rather more than twice as broad as long, transverse on the anterior margin. Eyes nearly parallel, slightly converging towards the vertex; the ocelli in a broad triangle, the posterior pair further from each other than from the eyes. Head smooth and slightly shining. The antennæ scarcely as long as thorax and median segment combined; the second joint of the flagellum no longer than the third. Pronotum about twice as broad as long, not depressed anteriorly. Median segment a little longer than broad, the posterior slope steep but not abrupt, the posterior angles very feebly produced. Abdomen subsessile, slender, a little compressed laterally, the apical segment very narrowly rounded at the apex. Anterior tarsi without a comb, posterior tibiæ spinose. Second cubital cell pointed on the radial nervure, the distance between the recurrent nervures a little greater than their distance from the base and apex of the second cubital cell. Cubitus of the hind wing originating a little beyond the transverse cubital nervure. Transverse median nervure of fore wing received a little beyond the basal nervure.

Black, with greyish-white pubescence as follows: on the clypeus, front, margins of the pronotum narrowly, a transverse line on the mesonotum, two spots on the scutellum, the postscutellum, pleuræ, a large spot at each angle, anterior and posterior, of the median segment, a spot at the base of the first dorsal abdominal segment, and a broad transverse band, narrowly interrupted in the middle, on the apical margin of the four basal segments. Wings very pale fusco-hyaline, rather darker on the apical third of the fore wing.

♂ similar to ♀.

Length, ♀ 8 mm., ♂ 5 mm.

Hab. Mackay, Q. (*Turner*). January.

A very distinct species, differing from other Australian species in the absence of the tarsal comb, the long median segment, and the pointed second cubital cell.

PLANICEPS UMBRATICUS, sp. n.

♀. Clypeus produced over the mandibles, twice as broad as long, very broadly rounded, subtruncate at the apex. Eyes reaching to the base of the mandibles; posterior ocelli far apart, nearly twice as far from each other as from the eyes. Antennæ only a little longer than the thorax without the median segment; the third joint of the flagellum almost as long as the second; the insertion of the antennæ distinctly higher than the base of the eyes. Pronotum as long as the mesonotum, a little narrowed anteriorly. Median segment half as long again as broad, depressed in the middle at the apex, the apical angles acutely produced. Abdomen subsessile, elongate. Fore femora not swollen, posterior tibiæ spinose. Two cubital cells, the second receiving the two recurrent nervures near the base and near the apex; second abscissa of the radius two and a half times as long as the first; the submedian cell shorter than the median; cubitus of the hind wing originating well beyond the transverse median nervure. Very minutely punctured, the abdomen and head slightly shining.

Black; the antennæ fuscous. Wings very pale flavo-hyaline, nervures black.

Length, ♀ 7 mm., ♂ 5 mm.

Hab. Mackay, Q. (*Turner*).

The head is flattened as in the genus *Planiceps*, and the long pronotum removes the species from the group of *Aporus* most nearly allied to typical *Pompilus*. The anterior tarsi are without a comb.

PLANICEPS AUREOVESTITUS, sp. n. (Plate XXXII. fig. 9, ♀.)

♀. Clypeus short, about three times as broad as long, the apical margin transverse. Eyes not nearly reaching the base of the mandibles, slightly convergent towards the vertex; ocelli in a wide triangle, the posterior pair further from each other than from the eyes. Antennæ about as long as the thorax and median segment combined, inserted a little higher than the base of the eyes; the second and third joints of the flagellum about equal in length. Pronotum as long as the mesonotum and almost as broad as the head, feebly rounded at the anterior angles, the posterior margin widely arched. Median segment broader than long, obliquely truncate posteriorly, with a deep sulcus on the surface of the truncation. Abdomen subsessile; the first segment as long as the breadth at the apex, the second segment longer than the first and slightly broader. Fore femora only slightly thicker than the intermediate, basal joint of the fore tarsi longer than the three following joints combined. Two cubital cells, the second receiving the two recurrent nervures at one-fifth from the base and one-fifth from the apex; second abscissa of the radius three times as long as the first, transverse median nervure interstitial with the basal nervure; cubitus of hind wing originating just beyond the transverse median nervure.

Black; smooth and slightly shining; a spot of dull and very short greyish pubescence at the base of the first dorsal abdominal segment and another at each of the apical angles; the third and fourth dorsal segments covered with coarse, close-lying, almost scale-like hairs of an ochreous colour. Wings hyaline, fuscous from the basal nervure to beyond the apex of the radial cell.

Length 9 mm.

Hab. Victoria (*C. French*).

This species does not quite correspond with the characters given by Ashmead for *Planiceps*, the fore femora being less swollen and the antennæ inserted a little higher. But, until the family is revised as a whole, I do not consider it advisable to found new genera.

PEDINASPIS EXULANS, sp. n.

♀. Clypeus broadly rounded at the apex, much broader than long, covering the mandibles. Eyes reaching the base of the mandibles, their inner margins curved, convergent both towards the clypeus and the vertex, separated on the vertex by a distance exceeding the length of the three basal joints of the flagellum; posterior ocelli twice as far from each other as from the eyes. Head much longer than broad, slightly convex, strongly concave beneath; the front slightly produced between the antennæ, which are inserted distinctly higher than the base of the eyes; the second and third joints of the flagellum of about equal length, each about twice as long as the first. Pronotum nearly as long as the mesonotum, depressed anteriorly, broader than long, the sides nearly parallel. Median segment about one-third longer than broad, the sides parallel, gently sloped towards the apex, the apical margin very widely emarginate, the angles produced into spines. Abdomen sessile, the two basal segments the broadest, the second longer than the first; second ventral segment without a transverse groove. Posterior tibiæ spined, anterior tarsi without a comb, tarsal ungues bifid. Second abscissa of the radius as long as the third, first recurrent nervure received before the middle of the second cubital cell, second near the apex of the third cubital cell; transverse median nervure interstitial with the basal nervure; cubitus of hind wing originating beyond the transverse median nervure. Minutely punctured, opaque.

Black, with close cinereous pubescence, which is thickest on the clypeus and pronotum and forms broad transverse bands on the apical margins of the abdominal segments. Wings subhyaline, nervures fuscous. Spines of the tibiæ whitish.

Length 9–10 mm.

Hab. Mackay, Q. (*Turner*). March.

PEDINASPIS NUDIVENTRIS, sp. n.

♀. Nearly related to *P. exulans*, but differs as follows:—the eyes are rather nearer together at the base than on the vertex, so that the clypeus is not so broad; the second joint of the flagellum is slightly shorter than the third and less than twice as long as the first; the third transverse cubital nervure is much less oblique; the whole insect is less opaque and almost without grey pubescence; the spines of the tarsi are pale testaceous; the wings flavo-hyaline on the basal half, subhyaline at the apex, nervures fulvous at the base, fuscous at the apex.

Length 9 mm.

Hab. Mackay, Q. (*Turner*). October.

The male has the eyes more nearly parallel, the joints of the flagellum arcuate beneath, pronotum and median segment shorter, and abdomen subconical. Antennæ fusco-ferruginous; fore tibiæ and tarsi testaceous brown.

CEROPALES LIGEA Bingh.

Ceropales ligea Bingh. Fascic. Malay. Zool. i. App. 5 (1903), ♀.

♀. Clypeus more than twice as broad as long, broadly subtruncate at the apex; the labrum exposed and narrowly truncate at the apex. Eyes broadly and rather deeply emarginate; posterior ocelli twice as far from the eyes as from each other. Antennæ stout, slightly tapering at the apex; a very delicate longitudinal sulcus on the front not reaching the anterior ocellus. Pronotum short, the posterior margin feebly arched, the anterior angles rounded; mesonotum with two rather obscure longitudinal furrows; scutellum convex. Median segment oblique, rather broader than long, with a short furrow from the base not reaching the middle. Abdomen ovate, short, not compressed laterally. Median segment opaque, the remainder of the insect smooth and slightly shining. Legs long and slender, the posterior tibiæ with minute spines.

Black; labrum, clypeus (except a median black line), inner margins of the eyes broadly as high as the emargination, outer margins of the eyes very narrowly, scape beneath, posterior margin of the pronotum, propleuræ anteriorly, tegulæ, postscutellum, apical angles of the median segment, coxæ, a line on the anterior and intermediate femora beneath and on the anterior tibiæ and tarsi, and a narrow, short, curved band on each side on the apical margin of the four basal abdominal segments yellowish white; anterior tibiæ fusco-ferruginous; posterior femora ferruginous. Wings hyaline, with a faint and narrow fuscous marginal band at the apex, nervures black. Second abscissa of the radius longer than the third.

Length 6–7 mm.

♂. As in female, but the head is entirely black, the clypeus and labrum fuscous, the scape alone marked with white beneath; the apical dorsal segment of the abdomen is white.

Length 6 mm.

Hab. Shwegyin, Tenasserim (*Bingham*); Mackay, Queensland (*Turner*). 1 ♂, 4 ♀.

Australian specimens differ in having the third abscissa of the radius almost if not quite as long as the second, but not otherwise.

This species is noticed in the 'Zoological Record' for 1903 as *Cerceris ligea.*

CEROPALES TENUATUS, sp. n. (Plate XXXII. fig. 10, ♀.)

♀. Clypeus subtriangular, a little broader than long, broadly truncate at the apex, the labrum exposed and broadly rounded at the apex. Eyes converging towards the clypeus, broadly but very shallowly emarginate; posterior ocelli rather less than twice as far from the eyes as from each other. Antennæ stout, the apical joints feebly arcuate beneath; the front not raised into a prominence between the antennæ. Pronotum short, the anterior margin straight, not rounded at the angles, the posterior margin scarcely arched; mesonotum with two distinct longitudinal furrows. Median segment rounded at the sides, rather steeply sloped, broader than long, with an obscure median sulcus. Abdomen nearly as long as the head, thorax, and median segment combined, very strongly compressed laterally. Legs unarmed, not unusually long. Head opaque, sparsely punctured; thorax shining, almost smooth; median segment very finely transversely striated; abdomen smooth, slightly shining. Second abscissa of the radius less than half as long as the third.

Black; labrum, clypeus, front as high as the base of the antennæ, scape, margins of the eyes broadly interrupted on the summit, prothorax, sternum, a broad band on the mesonotum from before the middle to the posterior margin, a narrow band above the tegulæ, pleuræ, scutellum (except on the sides and extreme apex), postscutellum, median segment (except a large black spot on each side at the base), and the femora beneath yellow; first and second abdominal segments, the base of the third, and the legs (except the posterior tarsi) light testaceous brown. Wings hyaline, iridescent, nervures fuscous, stigma testaceous brown.

Length 12 mm.

Hab. Cairns, Q. (*Turner*). February.

Fam. SPHEGIDÆ.

Genus PARACRABRO Turn.

Paracrabro Turn. Ann. & Mag. Nat. Hist. (7) xix. p. 274 (1907).

This genus is perhaps nearest to *Stigmus*, but also shows points of affinity to *Pemphredon.*

Type of genus, *P. froggatti* Turn. (Plate XXXII. fig. 11, ♀.)

Genus APHELOTOMA Westw.

APHELOTOMA AURIVENTRIS Turn.

Aphelotoma auriventris Turn. Ann. & Mag. Nat. Hist. (7) xix. p. 269 (1907), ♀.

♂. As in the female, but the antennæ, mandibles, tibiæ, and tarsi are much darker than in the female, the antennæ and mandibles being almost black. The apical segments of the abdomen are also more withdrawn. The second recurrent nervure in this species is interstitial with the second transverse cubital nervure.

APHELOTOMA STRIATICOLLIS, sp. n.

♀. Clypeus small, shining; the labrum prominent and notched at the apex. Mandibles very sharply bent near the base, the apical half falcate and acute at the apex, the basal half much broadened, with a tooth near the middle of the inner margin. Antennæ inserted much further from each other than from the eyes, filiform; the second joint of the flagellum as long as the first joint and the scape combined. Head opaque, the front very finely and indistinctly longitudinally striated; the inner margin of the eyes nearly parallel; the posterior ocelli nearer to the eyes than to each other. Pronotum much narrower than the head, longer than the mesonotum, longer than broad, finely rugose, the sides raised and forming marginal carinæ, two parallel longitudinal carinæ close together near the middle reaching from the anterior to the posterior margin. Mesonotum and scutellum coarsely longitudinally rugose; propleuræ finely, mesopleuræ coarsely rugose. Median segment very coarsely reticulate, the sides obliquely striated, vertically truncate posteriorly, longer than the pronotum, broader than long. Abdomen smooth and shining, the third and following segments very minutely punctured. First recurrent nervure received beyond two-thirds from the base of the first cubital cell, second received near one-fifth from the base of the third cubital cell. The branch nervure from the first transverse cubital nervure reaching into the first cubital cell is very short.

Black; the mandibles and the apical joints of the tarsi beneath fusco-ferruginous; abdomen shining bronze. Wings fusco-hyaline, clearer at the apex, with a broad hyaline band crossing the first cubital cell; nervures fuscous, testaceous in the hyaline band.

Length 8 mm.

Hab. Townsville, Q. (*F. P. Dodd*). October.

Near *auriventris* Turn., but the position of the recurrent nervures is different; it also differs in the shape and sculpture of the pronotum and in colour.

APHELOTOMA AFFINIS, sp. n.

♀. Mandibles shaped very much as in *striaticollis*, but more broadly flattened on the basal half and with a small tubercle near the base on the outer margin. Clypeus small, shining. Second joint of the flagellum about equal to the scape in length; the antennæ inserted further from each other than from the eyes. Head opaque, a delicate longitudinal carina below the anterior ocellus. Pronotum much narrower than the head, longer than broad, the sides parallel, finely rugulose, the lateral margins raised, with a longitudinal median sulcus. Mesonotum and scutellum coarsely longitudinally rugose, the mesonotum with an impressed, obscure, longitudinal line on each side. Median segment narrowed to the apex and vertically truncate posteriorly, reticulated, the margins slightly raised and with three rather obscure carinæ, the two lateral ones converging towards the apex. Abdomen smooth and shining. Second recurrent nervure received close to the base of the third cubital cell.

Black; mandibles and antennæ, except the three apical joints, ferruginous; tegulæ, tibiæ beneath, and tarsi fusco-ferruginous. Anterior wings pale fusco-hyaline, a broad hyaline band crossing the first cubital cell.

Length 6 mm.

Hab. Townsville, Q. (*F. P. Dodd*). November.

This may possibly be the female of *A. aterrima* Turn., but the sculpture of the thorax is very much coarser in the present species and the median segment more narrowed to the apex, so I think it is distinct.

AMMOPHILA (PARAPSAMMOPHILA) EREMOPHILA, sp. n. (Plate XXXII, fig. 12, ♂.)

♂. Clypeus sparsely and shallowly punctured, very thinly clothed with long cinereous pubescence, very slightly convex, with a very faint longitudinal carina not extending to the base or apex, a little broader than long, the apical margin broadly truncate. Eyes slightly convergent towards the clypeus, separated on the vertex by a distance one-quarter greater than on the clypeus; the posterior ocelli a little further from the eyes than from each other, connected with each other behind by a deeply impressed and feebly arched sulcus. Head irregularly and rather sparsely punctured; the front clothed with short silver-white pubescence, with a few long cinereous hairs; a shallow sulcus running from the anterior ocellus to the base of the antennæ. First joint of the flagellum very short, the second a little longer than the first and third combined. Pronotum closely punctured and clothed with long cinereous pubescence, short and almost vertically sloped anteriorly; mesonotum closely punctured, the punctures running into longitudinal striæ on the posterior half. Scutellum and postscutellum rather indistinctly longitudinally striated. Median segment strongly convex, reticulate on the middle, obliquely striated on the sides. Mesopleuræ coarsely punctured, separated from the metapleuræ by a deep, shining, oblique groove, and very sparsely pubescent. Abdomen shining and almost smooth; the ventral plate of the petiole seen from above almost as long as the two basal joints of the posterior tarsus. Tarsal ungues bidentate at the base, the pulvillus large. Second cubital cell very short on the radial nervure, not more than one-third of the length of the third, which is longer on the radial than on the cubital nervure; the second cubital cell is nearly twice as long as the third on the cubital nervure and receives the first recurrent nervure just before the middle, the second just before the apex.

Entirely black; wings pale flavo-hyaline, clearer towards the apex, nervures testaceous.

Length 24–25 mm., expanse of wings 32 mm.

♀ unknown.

Hab. Hermannsburg, Central Australia (*H. J. Hillier*).

Described from two specimens in the British Museum.

SCELIPHRON LÆTUM Sm. st. CYGNORUM st. n.

♀. Very near typical *lætum*, but differs in the following details: the depression in the middle of the pronotum is much deeper, the second cubital cell is longer on the radial nervure, and the yellow markings are absent from the scutellum, postscutellum, apex of the median segment, and fourth abdominal segment; the base of the intermediate femora is marked with black and the yellow on the pronotum and fifth abdominal segment is more or less reduced.

Hab. South-Western Australia.

An intermediate form occurs in the north-west, in which the second cubital cell is of the same shape as in the typical form and the intermediate femora and postscutellum are coloured as in the type, the scutellum is also marked with yellow. The typical form occurs at Hermannsburg, Central Australia, and on the north and east coasts.

Key to the Australian Species of Sphex.

♀♀.

A. Second cubital cell higher than broad .	Subgenus HARPACTOPUS.
a. Wings flavo-hyaline, the apical third pale fusco-hyaline	***S. sævus*** Sm.
b. Wings hyaline, clouded at the apex	***S. globosus*** Sm.
B. Second cubital cell as broad as high or broader.	
a. Third abscissa of the radius half as long as the second transverse cubital nervure or nearly; the median segment without a stigmal sulcus	Subgenus ISODONTIA.
a^2. Legs ferruginous	***S. abditus*** Kohl, st. ***nugenti***.
b^2. Legs black.	
a^3. Petiole much shorter than the basal joint of the hind tarsi; wings pale flavo-hyaline	***S. claviger*** Sm.
b^3. Petiole nearly as long as the basal joint of the hind tarsi or longer; wings hyaline or fuscous.	
a^4. Wings fuscous or fusco-hyaline, glossed with purple	***S. albohirtus*** Turn.
b^4. Wings hyaline, clouded at the apex.	
a^5. Petiole longer than the basal joint of the hind tarsi.	***S. nigellus*** Sm.
b^5. Petiole scarcely as long as the basal joint of the hind tarsi ..	***S. obscurellus*** Sm.

- *b*. Third abscissa of the radius much less than half as long as the second transverse cubital nervure; median segment with a stigmal sulcus . . . . Subgenus SPHEX.
  - *a*². Scutellum divided by a longitudinal sulcus.
    - *a*³. Postscutellum bituberculate in the middle.
      - *a*⁴. Median segment coarsely transversely rugose-carinate . . . . . . *S. aurulentus* Fabr.
      - *b*⁴. Median segment not rugose-carinate.
        - *a*⁵. Legs and abdomen at the base and apex ferruginous orange . . . . . . *S. decoratus* Sm.
        - *b*⁵. Entirely black.
          - *a*⁶. Pubescence on thorax and median segment very sparse . . . . . . *S. umbrosus* Chr.
          - *b*⁶. Pubescence on thorax and median segment close, white on median segment, pale golden on mesonotum, scutellum bare . . . . . . *S. umbrosus* Chr., var. *carbonarius* Sm.
    - *b*³. Postscutellum not bituberculate.
      - *a*⁴. Median segment transversely rugose-carinate . . . . . . *S. rugifer* Kohl.
      - *b*⁴. Median segment not rugose-carinate.
        - *a*⁵. Legs and abdomen light ferruginous. *S. argentifrons* Sm.
        - *b*⁵. Legs and abdomen black.
          - *a*⁶. Mesonotum and median segment very thickly covered with pile.
            - *a*⁷. The long hairs on the clypeus black . . . . . . *S. ahasuerus* Kohl.
            - *b*⁷. The long hairs on the clypeus golden.
              - *a*⁸. Scutellum strongly convex, the longitudinal sulcus rather indistinct . . *S. cognatus* Sm.
              - *b*⁸. Scutellum not strongly convex, the sulcus distinct. . . . *S. vestitus*, Sm.
          - *b*⁶. Mesonotum and median segment rather sparsely pubescent.
            - *a*⁷. Postscutellum divided by a longitudinal sulcus; wings flavo-hyaline at the base . . . . *S. modestus* Sm.
            - *b*⁷. Postscutellum without a sulcus, wings subhyalin . . . . . . *S. bilobatus* Kohl.
  - *b*². Scutellum without a sulcus.
    - *a*³. Abdomen black.
      - *a*⁴. Clypeus notched on the middle of the anterior margin.
        - *a*⁵. Wings hyaline, clouded at the apex, the nervures at the base broadly dark . . . . . . *S. luctuosus* Sm.
        - *b*⁵. Wings fuscous with a faint purple flush, paler at the apex. . . . . . . *S. luctuosus* Sm., var. *fumipennis* Sm.
      - *b*⁴. Clypeus without a notch . . . . . . *S. ermineus* Kohl.
    - *b*³. Abdomen steel-blue.
      - *a*⁴. Wings fuscous with a purple flush . . . *S. gratiosissimus* D. T.
      - *b*⁴. Wings flavo-hyaline with a light fuscous border at the apex . . . . . . *S. gilberti* Turn.

S. gilberti has sometimes a very faint line on the scutellum, and in *S. modestus* Sm. the postscutellum is sometimes almost bituberculate.

SPHEX (HARPACTOPUS) GLOBOSUS Sm.

Sphex globosa Sm. Cat. Hym. B. M. iv. p. 251 (1856), ♂ ♀.

Harpactopus australis Sauss. Reise Novara, Zool. ii. p. 42 (1867), ♀.

I cannot agree with Kohl in treating these forms as different. The extreme specimens of a series show considerable difference in the sculpture on the mesopleuræ, but intermediate forms, of which the type of *globosus* is one, seem to occur. The pile on the sides of the abdominal segments seems to be present in all fresh specimens, and the brown margin of the abdominal segments is variable, almost absent in the type. I have not seen any specimens exceeding 17 mm. in length.

SPHEX (ISODONTIA) ABDITUS Kohl, st. NUGENTI, st. n.

♀. Differs from the typical form in the following details:—the second joint of the flagellum is distinctly longer than the third, the punctures on the thorax are very shallow, the pubescence on the thorax and median segment is black, erect, and sparse, and the apical joint of the tarsi is ferruginous, leaving only the coxæ and trochanters black on the legs.

Length 19 mm.

Hab. Cairns, Q.

Kohl gives the locality Sikkim, but expresses doubt as to the correctness of the information. In my opinion *abditus* is scarcely distinct from *aurifrons* Sm. from Aru, the latter species differing in the testaceous margins of the abdominal segments which are also slightly pruinose. In Queensland the present form seems to be very scarce and has not been previously recorded.

SPHEX VESTITUS Sm.

Sphex vestita Sm. Cat. Hym. B. M. iv. p. 248 (1856), ♀.

Sphex prætexta Sm. Brenchley's Cruise of the 'Curaçoa,' p. 461 (1873), ♀.

Sphex imperialis Kohl, Ann. Naturh. Hofmus. Wien, v. p. 398 (1890), ♀.

This is very near *cognatus* Sm., but where they occur together the female *cognatus* has the wings flavo-hyaline at the base, and the pubescence on the median segment is much paler in both sexes. The male genitalia are also different, the eighth ventral segment being produced into a point in *cognatus*, whilst in *vestitus* it is deeply longitudinally grooved beneath and not pointed; the petiole is somewhat longer in *cognatus*, and it is a much smaller species than *vestitus*. Kohl gives *prætexta* as a synonym of *formosus*, but this is not correct.

Hab. Gayndah, Q. (*Kohl*); Mackay and Cairns, Q. (*Turner*).

SPHEX COGNATUS Sm.

Sphex cognata Sm. Cat. Hym. B. M. iv. p. 248 (1856), ♀.

Sphex opulenta Sm. Cat. Hym. B. M. iv. p. 250 (1856), ♂.

Sphex formosa Sm. Cat. Hym. B. M. iv. p. 254 (1856), ♀.

Kohl gives *opulenta* as a synonym of *umbrosus*, but it is quite distinct from that species.

Hab. Australia (the northern half); Ceram; Semao Isl.

SPHEX MODESTUS Sm.

Sphex modesta Sm. Cat. Hym. B. M. iv. p. 248 (1856), ♀.

Sphex dolichocerus Kohl, Ann. Naturh. Hofmus. Wien, v. p. 390 (1890), ♂.

Sphex bannitus Kohl, Ann. Naturh. Hofmus. Wien, x. p. 62 (1895), ♀.

As Kohl suggests, his *bannitus* is undoubtedly a synonym of *modestus*, and I consider that *dolichocerus* is almost certainly the male of the same species. In all three descriptions the locality given is only Australia, but there is a series in the British Museum from Alexandria in the Northern Territory, and it is also in the collection sent by Mr. Giles from Perth.

SPHEX BILOBATUS Kohl.

Sphex canescens Sm. Cat. Hym. B. M. iv. p. 246 (1856), ♂ ♀.

Sphex bilobatus Kohl, Ann. Naturh. Hofmus. Wien, x. p. 59 (1895), ♂ ♀.

The name *canescens* having been previously used by Dahlbom is a synonym of *S. viduatus*, and Kohl's name should be used.

Hab. Adelaide (*Kohl*); Cumberland, N.S.W.

SPHEX GRATIOSISSIMUS Dalla Torre.

Sphex nitidiventris Sm. Journ. Proc. Linn. Soc., Zool. iii. p. 158. n. 4 (1858), ♀ (*nec* Spinola, 1851).

Sphex gratiosus Sm. Journ. Proc. Linn. Soc., Zool. iii. p. 158. n. 6 (1858), ♂ (*nec* Smith, 1856).

Sphex gratiosissimus D. T. Cat. Hym. viii. p. 424 (1897), ♂.

Sphex wallacei Turn. Proc. Zool. Soc. 1908, p. 467, ♀.

As *gratiosus* and *nitidiventris* are sexes of the same species, Dalla Torre's name stands. It is very near *resplendens* Kohl, but as I have not seen Amboina specimens I cannot be sure that they are identical.

CERCERIS GILESI, sp. n. (Plate XXXII. fig. 13, ♂.)

♀. Clypeus sparsely but rather coarsely punctured, the middle lobe almost semicircular but broader at the apex than long, broadly but rather shallowly emarginate at the apex, the angles of the emargination produced into very short blunt teeth, with another more acute tooth on each side beyond the emargination. Antennæ inserted near together, separated from the base of the clypeus by a distance equal to two-thirds of the length of the middle lobe of the clypeus; the first joint of the flagellum globular, the second joint a little longer than the third, the apical joint subconical, a little longer than the tenth. Inner margins of the eyes slightly divergent towards the clypeus, separated from each other at the nearest point by nearly two and a half times the length of the scape. Posterior ocelli about half as far again from the eyes as from each other. The whole insect coarsely and closely punctured; the punctures on the mesonotum more or less confluent longitudinally. The triangular space at the base of the median segment is almost smooth in the middle and at the apex, obliquely striated at the basal angles and divided by a deep longitudinal median sulcus. Petiole short, nearly twice as broad as long; pygidial area elongate-ovate, truncate at the apex, coarsely punctured at the base, smooth at the apex.

Black; the clypeus, interantennal carina, mandibles, the face as high as the base of the antennæ and extending to the eyes, only narrowly separated from the interantennal carina, the scape, flagellum beneath, a broad transverse band narrowly interrupted in the middle on the pronotum, tegulæ, a transverse band at the apex of the scutellum, postscutellum, two basal abdominal segments, the dorsal surface of the fifth segment, and the legs bright reddish orange. Wings hyaline, the fore wings clouded with fuscous along the costa, nervures black.

Length 11 mm.

♂. Differs from the female in the form of the clypeus which is longer and not emarginate at the apex, the narrower front and the more nearly parallel sides of the pygidial area, which is also more strongly punctured towards the apex. The fifth, sixth, and seventh dorsal segments are orange—not only the fifth, as in the female—and the clypeus and front are yellow.

Hab. Claremont, W. A. (*H. M. Giles*). December.

CERCERIS MINUSCULA, sp. n.

♀. Clypeus rather sparsely punctured, the middle lobe broadly and shallowly emarginate at the apex, not toothed, slightly narrowed towards the apex, a little shorter than the greatest breadth. Antennæ separated from the base of the clypeus by about two-thirds of its length; the third joint of the flagellum as long as the second, the apical joint stout and subconical, longer than broad. Posterior ocelli more than half as far again from the eyes as from each other; inner orbits of the eyes nearly parallel, separated by a distance equal to more than two and a half times the length of the scape. The whole insect closely and deeply punctured, the triangular space at the base of the median segment transversely striated. Petiole broader than long, narrowed a little to the base and the apex; pygidial area elongate-ovate, narrowly rounded at the apex, finely punctured.

Black; mandibles (except at the apex), clypeus, the sides of the face broadly as high as the base of the antennæ, the scape beneath, the frontal carina, a transverse spot on each side of the pronotum, postscutellum, the sides and apex of the third dorsal segment of the abdomen, the sides of the third ventral segment, and the sides and apex of the fifth dorsal segment, pale dull yellow; the scape above, the flagellum, tegulæ, petiole, the extreme apical margin of the second dorsal segment, the base of the third, and the pygidium, dull ferruginous. Intermediate and anterior tibiæ yellow above, posterior tibiæ yellow beneath; intermediate and anterior femora, the apex of the posterior femora, the tibiæ (excluding the yellow parts), and the tarsi ferruginous. Wings hyaline with a faint fuscous cloud at the apex, nervures black.

Length 7–8 mm.

♂. Similar to the female, but the clypeus is toothed at the apex and not emarginate, the third joint of the flagellum is distinctly longer than the second, the striæ on the triangular space at the base of the median segment are less distinct, the sides of the pygidial area are almost parallel and it is narrowly truncate at the apex; the sixth dorsal segment and a transverse band at the base of the second are yellow, the petiole black, the tegulæ yellow, and yellow replaces the ferruginous colour on the anterior and intermediate legs.

Length 6–7 mm.

Hab. Mackay, Q. (*Turner*); Townsville, Q. (*Dodd*); Hermannsburg, Central Australia (*Hillier*). February to April.

TACHYSPHEX SUBOPACUS, nom. n.

Tachysphex debilis Turn. Proc. Zool. Soc. 1908, p. 490 (*nec* Perez, 1907).

Key to the Australian Species of Tachytes.

♀ ♀.

A. Abdomen red or testaceous red.	
a. Abdomen red. Head and thorax black, without pile ...	*T. rubellus* Turn.
b. Abdomen testaceous red. Thorax covered with golden pile ...	*T. formosissimus* Turn.
B. Abdomen black.	
a. Pile of abdomen golden.	
*a*². Tibiæ and tarsi black. Length 20 mm. ...	*T. plutocraticus*.
*b*². Tibiæ and tarsi ferruginous. Length 14 mm. ..	*T. approximatus* Turn.
b. Pile of abdomen silver.	
*a*². Stiff pubescence on pygidial area golden ...	*T. tarsatus* Sm.
*b*². Pubescence on pygidial area silver ...	*T. australis* Sauss.

I am not sure that my identification of *australis* is correct, the description being poor and of the male only. I have not been able to recognise *T. tachyrrhostus* Sauss., of which the male only has been described. *T. australis* Sauss. 1854 seems to be a *Larra* and certainly does not belong to *Tachytes*.

TACHYTES TARSATUS Sm.

Tachytes tarsatus Sm. Cat. Hym. B. M. iv. p. 297 (1856), ♀.

Hab. Mackay and Cairns, Q. Also from India.

I think I am correct in my identification of this species, but I have not seen the type, and the species run very close in this genus.

TACHYTES PLUTOCRATICUS, sp. n.

♀. Clypeus very broadly rounded at the apex, finely and closely punctured, the apical margin strongly raised, with a narrow transverse depression before it. Head and clypeus clothed with rather long, close, cinereous pubescence, which changes to silver-white in some lights; the head finely and closely punctured. Second joint of the flagellum almost as long as the first and third combined. Eyes separated on the vertex by a distance almost equal to the length of the second joint of the flagellum. Thorax very finely and closely punctured; the mesonotum margined with shining silvery pubescence on the sides above the tegulæ; the scutellum with a delicate median sulcus. Median segment very delicately punctured-rugulose, narrowed to the apex and very steeply sloped posteriorly, with a large triangular puncture at the apex and a longitudinal sulcus on the posterior slope, the dorsal surface thinly clothed with cinereous pubescence, the sides and the mesopleuræ more closely clothed with greyish-white pubescence. Six spines on the basal joint of the anterior tarsi, including the apical spine. Abdomen clothed with rather pale golden pile, thickest and brightest on a broad band at the apex of each segment and on the pygidial area, which is elongate-triangular, very narrowly rounded at the apex. The third cubital cell is very long on the cubital nervure, approaching as near as half its own length to the outer margin of the wing, and about equal in length to the second on the radial nervure.

Black; the tegulæ, the spines of the tibiæ and tarsi, and the apical margin of the abdominal segments (broadly on the dorsal, very narrowly on the ventral surface) testaceous. Wings pale flavo-hyaline, nervures pale ferruginous.

Length 19 mm.

Hab. Townsville, Q. (*F. P. Dodd*). January.

This fine species is nearly related to *monetarius* Sm., from which it differs in the narrower pygidial area, the greater length of the third cubital cell on the cubital nervure, and the paler colour of the wings and of the pile on the abdomen. The sulcus on the scutellum is absent in the type of *monetarius*, which is from North India. The species has a wide range in Africa, but in specimens I have seen from West Africa the eyes approach each other more closely on the vertex than in the typical form, and the pygidial area is narrower as in the Australian species.

SPHODROTES CYGNORUM, sp. n.

♀. Mandibles very deeply and rather widely excised on the outer margin. Clypeus very broadly rounded anteriorly. Head, thorax, and abdomen closely and coarsely punctured, the punctures on the abdomen finer than on the thorax. Inner margins of the eyes diverging very slightly towards the clypeus; posterior ocelli nearly as far from each other as from the eyes; the posterior margin of the head broadly emarginate. Pronotum much narrower than the head, narrowed and steeply sloped anteriorly. Median segment much broader than long, very coarsely rugose, longitudinally striated at the base, almost vertically truncate posteriorly, the surface of the truncation coarsely rugose, the sides of the segment coarsely obliquely striated. Abdomen broad at the base, narrowed and pointed at the apex, the first segment rounded at the anterior angles, the second segment very large, a little broader than the first; the apical segments narrowing rapidly; the sixth segment small, narrowly triangular, pointed and sparsely punctured, smooth and shining beneath.

Opaque black; the legs (except the coxæ), the tegulæ, and the apex of the scape ferruginous; mandibles fuscous. Wings hyaline, clouded with fuscous, nervures fuscous.

Flagellum missing. The neuration is as in Kohl's figure of *S. punctuosus*, but the third cubital cell is much shorter on the radial nervure, the third abscissa of the radius being little more than half as long as the third transverse cubital nervure; the radial cell is rounded at the apex, not appendiculate.

Length 10 mm.

Hab. Claremont, W. A. (*H. M. Giles*).

Very near *punctuosus* Kohl, which was described from a male, and I should have hesitated to separate the present species but for the marked difference in the shape of the third cubital cell, which is not likely to be sexual.

NYSSON (ACANTHOSTETHUS) OBLITERATUS, sp. n.

♂. Clypeus produced in the middle over the mandibles and truncate at the apex, strongly transversely depressed at two-thirds from the base, the depressed apical portion microscopically punctured, the raised basal portion sparsely punctured and produced at the apical angles into very short carinæ bordering the depressed portion at the base. Eyes converging towards the clypeus, separated on the vertex by a distance at least half as great again as that separating them on the clypeus; the posterior ocelli as far from each other as from the eyes. Head rather shallowly punctured-rugose, covered with short white pubescence, close on the clypeus, sparse elsewhere; a transverse carina on the front, nearer to the base of the antennæ than to the anterior ocellus, not reaching the eyes, slightly pointed in the middle and produced into a strong longitudinal carina reaching to the base of the clypeus. Antennæ gradually thickened to the apex, the second joint of the flagellum the longest, a little longer than the apical joint. Thorax coarsely punctured-rugose, the anterior margin of the pronotum broadly arched, the anterior angles of the propleuræ with a minute spine. Scutellum and median segment longitudinally striate-rugose; the scutellum almost flat; the apical angles of the median segment produced into stout spines, the surface of the posterior truncation longitudinally striated at the base, then reticulate; the sides of the segment indistinctly obliquely striated. Abdomen ovate, broadly truncate at the base, rather closely punctured, coarsely on the basal segment, more finely on the second and third segments, the punctures on the apical segments more or less confluent longitudinally; the apical dorsal segment much broader than long, rather narrowly truncate at the apex.

Opaque black; the first dorsal segment of the abdomen dull ferruginous; a short transverse line on each side at the apex of each of the three basal dorsal segments yellowish white; mandibles, apex of the scape, anterior tibiæ and tarsi, and the apical joints of the posterior tibiæ and tarsi ferruginous brown; the depressed apex of the clypeus testaceous. Wings pale fusco-hyaline, nervures black.

The second cubital cell is petiolate; second recurrent nervure interstitial with the first transverse cubital nervure.

Length 9 mm.

Hab. South Perth, W. A. (*H. M. Giles*).

This seems to differ too much from *basalis* Sm. to be the opposite sex of that species; the second cubital cell in *basalis* is pointed on the radial nervure but not petiolate, and the sculpture differs considerably.

BEMBEX CURSITANS Handl.

Bembex cursitans Handl. Sitzber. Akad. Wiss. Wien, cii. p. 762 (1893), ♂ ♀.

Hab. South Perth, W. A. (*H. M. Giles*).

BEMBEX FURCATA Erichs.

Bembex furcata Erichs. Arch. f. Naturges. viii. 1. p. 266 (1842).

Hab. The southern coast of Australia from Perth to Sydney; Tasmania.

BEMBEX FLAVIVENTRIS Sm.

Bembex flaviventris Sm. Ann. Mag. Nat. Hist. (4) xii. p. 299 (1873), ♂ ♀.

? *Bembex calcarina* Handl. Sitzber. Akad. Wiss. Wien, cii. p. 754 (1893), ♂.

The dilated spur of the anterior tibiæ in *flaviventris* answers well to Handlirsch's figure. The type answers to the description of *calcarina*, but none of the bands on the six basal dorsal segments are interrupted and the postscutellum is also banded with colour. Handlirsch does not notice the structure of the apical joint of the intermediate tarsi, which is very slender at the base, long, and broadened at the apex.

BEMBEX MACKAYENSIS, sp. n.

♂. Clypeus strongly convex, not flattened in the middle. Antennæ inserted as near to each other as to the eyes, the apical joint of the flagellum curved at the apex, joints 8–11 very feebly spined beneath. Eyes very slightly divergent towards the clypeus. Anterior tarsi normal, the basal joint with six spines on the outer margin; intermediate femora not serrate, the spurs of the intermediate tibiæ distinct. Seventh dorsal segment of the abdomen narrowly rounded at the apex, the sides slightly sinuate; second ventral segment with a large, curved, longitudinal tubercle which is broadly truncate at the apex; sixth segment armed with a large, flattened, triangular plate; seventh small, with a longitudinal carina; eighth segment with a well-developed apical spine. Finely and closely punctured; the head, thorax, and base and sides of the abdomen covered with short grey pubescence, the second ventral segment shining and more sparsely punctured.

Black; the labrum (except on the sides and apex), the apical half of the clypeus, an obscure curved line on each side of the ocelli, the anterior and intermediate tarsi, tibiæ above, femora at the apex above, base of the posterior tibiæ and the outer orbits of the eyes very narrowly yellow; a narrow curved band, broadly interrupted in the middle on dorsal segments 2–5, and a spot on each side of the second and third ventral segments whitish. Wings hyaline, nervures fuscous. One very short vein springs from the apex of the median cell of the hind wing.

Length 12 mm.

♀. Sixth dorsal segment very narrowly rounded at the apex, sparsely punctured and without a median area. Clypeus black, the apical margin very narrowly yellow; labrum yellow, black at the extreme apex; scape beneath, posterior margin of the pronotum, propleuræ, a spot on the mesopleuræ, a short narrow line on each side of the disc of the mesonotum, and a small spot on each side of the scutellum yellow; a transverse spot on each side of the first abdominal segment and a minute one on each side nearer the middle dull creamy white. Otherwise marked as in the male, but the abdominal bands are broader.

Hab. Mackay and Cairns, Q. (*Turner*). 3 ♂, 1 ♀. October and December.

Very near *tuberculiventris* Turn., but in that species the anterior tarsi have eight spines and the seventh ventral segment is different. The colour also differs considerably, especially on the ventral surface of the abdomen, which is black in the present species. Also allied to *flavipes* Sm.

BEMBEX FLAVIPES Sm.

Bembex flavipes Sm. Cat. Hym. B. M. iv. p. 325 (1856), ♀.

♂. The seventh, eighth, ninth, and tenth joints of the flagellum are slightly produced at the base beneath, the eleventh is broadened and flattened above and produced into a tubercle beneath, the apical joint is sharply curved and terminates in an acute spine. The three basal joints of the anterior tarsi are broadened, but not strongly so. The tubercle of the second ventral segment is truncate at the apex, resembling that of *B. tuberculiventris* Turn. in form, and the sixth ventral segment is armed with a triangular plate. Intermediate femora not serrate. The clypeus is white and is very prominent at the base, then almost vertically truncate to the apex, the extreme base is black.

Hab. Mackay, Q. (*Turner*). ♂ ♀. October.

Allied to the group *musca* Handl., and most nearly related to *tuberculiventris* Turn.

BEMBEX LITTORALIS Turn.

Bembex littoralis Turn. Proc. Zool. Soc. 1908, p. 502, ♂.

This is very near *B. musca* Handl. and may prove to be identical, but the antennæ in *musca* seem to be rather different. The species in this group seem to be very close to each other.

BEMBEX ATRIFRONS Sm.

Bembex atrifrons Sm. Cat. Hym. B. M. iv. p. 327 (1856), ♀.

? *Bembex flavilabris* Sm. Ann. Mag. Nat. Hist. (4) xii. p. 299 (1873), ♀.

I can see no difference between *atrifrons* and *flavilabris*, except in the greater development of the markings on the latter.

The male has the labrum black; the eighth joint of the flagellum slightly produced at the base, the three following joints feebly spined beneath at the apex; anterior tarsi with a row of well-developed black lobes on the outer margin; intermediate femora emarginate and serrate in the middle beneath; second ventral segment with a large, compressed, curved, longitudinal tubercle, third segment with a faint longitudinal carina, sixth segment unarmed.

Hab. South Perth, W. A. (*H. M. Giles*). December and January.

BEMBEX FUNEBRIS, sp. n.

♂. Mandibles with one tooth on the inner margin; labrum longer than the mandibles, shining, very finely and sparsely punctured. Clypeus convex, with very short, fine pubescence. Antennæ inserted as far from the eyes as from each other; the second joint of the flagellum about half as long again as the third, the seventh emarginate at the apex beneath, the eighth with a small spine at the base beneath; a low longitudinal carina between the antennæ. Inner margins of the eyes almost parallel, diverging very slightly towards the clypeus. Basal joint of the anterior tarsi not thickened, feebly lobed on the outer margin, with seven spines; intermediate femora rather feebly serrate beneath. Abdomen rather slender; the second ventral segment with a compressed, moderately elevated, longitudinal tubercle, not curved at the apex; the third segment subcarinate longitudinally; seventh and eighth segments longitudinally carinate, the eighth with a short apical spine. Seventh dorsal segment broad, very broadly rounded at the apex. Finely and closely punctured.

Black; a spot at the base of the scape, the tibiæ beneath, the anterior tarsi beneath at the base, and the femora beneath at the apex pale yellow. A very short and very narrow transverse band, sometimes entirely absent, on each side of the second and third dorsal segments pale greenish grey. Wings hyaline, tinged with fuscous, nervures black.

There is a delicate, longitudinal, median carina on the anterior half of the mesonotum.

Length 17 mm.

Hab. South Perth, W. A. (*H. M. Giles*). 3 ♂. January.

Very near *atrifrons* Sm., but differs in the more even serration of the intermediate femora, which in this species is continued from the apex almost to the base, whereas in *atrifrons* the apical half is not serrate and the extreme base is rather abruptly broadened and also smooth. In *atrifrons* the lobes of the basal joint of the anterior tarsi are more strongly developed and the seventh dorsal segment is more narrowly rounded at the apex.

BEMBEX AUREOFASCIATA, sp. n. (Plate XXXII. fig. 14, ♂.)

♂. Mandibles with one tooth on the inner margin; labrum longer than mandibles, smooth, and without a sulcus. Clypeus convex, somewhat flattened in the middle, covered with very short, delicate, white pubescence. Inner margins of the eyes parallel; the antennæ inserted a little further from each other than from the eyes, the scape rather stout; second joint of the flagellum nearly as long as the third and fourth combined, none of the joints emarginate, spined, or hollowed. Anterior tarsi not thickened; the basal joint with six spines on the outer margin including the two apical spines, the outer margin very feebly lobed and narrowly margined with black; intermediate femora serrate beneath; intermediate tibiæ with the apical spines well developed. First ventral segment with a longitudinal carina at the base; the second segment with a very strong longitudinal carina, which is rounded, curved, and very prominent at the apex, very similar in shape to that of *B. musca* Handl. Sixth ventral segment not modified, the eighth ending in an acute apical spine. Seventh dorsal segment rounded at the apex. Closely and finely punctured; the head, thorax, and base of the abdomen with cinereous pubescence.

Black; the mandibles (except at the apex), labrum, clypeus, the extreme base of the scape, pronotum, tegulæ, the scutellum (except in the middle), postscutellum, femora, tibiæ and tarsi, a broad band at the base of the first dorsal segment of the abdomen, a narrow band at the apex of the first ventral segment, a broad band on the middle of the second segment above and beneath marked with a small black spot on each side on the dorsal surface, and a narrower band emarginate on each side anteriorly on the third dorsal segment, orange-yellow. Wings pale fusco-hyaline, clear hyaline at the apex, nervures fuscous.

Length 16 mm.

Hab. South Perth, W. A. (*H. M. Giles*). January.

Allied to *B. atrifrons* Sm., but in that species the seventh and eighth joints of the flagellum are not normal and there is a seventh spine on the basal joint of the anterior tarsi; the colour is very different, being in *aureofasciata* of the orange shade which is characteristic of many Australian Aculeates, but which does not occur, so far as I know, in any other species of *Bembex*.

Genus Auchenophorus Turn.

Auchenophorus Turn. Ann. & Mag. Nat. Hist. (7) xix. p. 270 (1907).

I was quite wrong in considering this genus as in any way related to the *Ampulex* section of the family. The true affinity is with *Nitela*, with which the neuration agrees fairly well, but the radial cell is not appendiculate and the cubitus of the hind wing originates further from the transverse median nervure; in these points agreeing with *Nitelopterus* Ashm. In that genus, however, the mandibles are deeply emarginate on the outer margin. The species of *Auchenophorus* resemble Mutillidæ, with which the female of *A. fulvicornis* was taken at Cairns, running on the ground with closed wings in localities where females of *Ephutomorpha* were plentiful.

Type of genus, *A. coruscans* Turn. (Plate XXXII. fig. 15, ♀.)

Pison perplexum Sm.

Pison perplexus Sm. Cat. Hym. B. M. iv. p. 314 (1856), ♂.

♀. Clypeus rather strongly advanced in the middle anteriorly, the anterior margin undulating at the sides, the produced apical portion smooth, the remainder closely and finely punctured. Head opaque, very minutely punctured, with a short longitudinal carina on the front; the eyes half as far again from each other on the clypeus as on the vertex; antennæ inserted nearer to each other than to the eyes; the second joint of the flagellum scarcely longer than the third. Pronotum rounded at the anterior angles. Thorax very finely and closely punctured. Median segment very finely and closely obliquely striated, punctured between the striæ, a longitudinal sulcus from the base to the apex in which lies a low carina. Abdomen opaque, very minutely punctured, the segments depressed on the apical margin and bordered with fine silver pubescence. Second cubital cell half as high as the third, receiving the two recurrent nervures near the base and very close to the apex.

Black; the tegulæ testaceous at the apex. Wings fusco-hyaline; nervures black.

Length 12 mm.

Hab. South Perth, W. A. (*H. M. Giles*). January.

Easily distinguished from the allied species by the shape of the clypeus, which is broadly rounded in *fuscipenne* Sm., and much less produced in *spinolæ* Shuck. The type is a male in which the second joint of the flagellum is much longer than the third. The clypeus of the male is produced into a point; but I think I am right in placing the female described above with *perplexum*.

Pison argentatum Shuck.

Pison argentatum Shuck. Trans. Ent. Soc. London, 1837, p. 79.

Pison ignavum Turn. Proc. Zool. Soc. 1908, p. 511.

The median segment in *ignavum* is more strongly striated than in the typical form, but the difference is not sufficient to be of full specific value.

EXPLANATION OF THE PLATES.

PLATE XXXI.

Fig. 1. *Rhagigaster corrugatus*, sp. n. ♂.
2. *Rhagigaster corrugatus*, sp. n. ♀.
3. *Eirone ferrugineicornis*, sp. n. ♂.
4. *Gymnothynnus* (?) *trianguliceps*, sp. n. ♀.
5. *Hemithynnus petulans* Sm. ♂.
6. *Hemithynnus petulans* Sm. ♀.
7. *Oncorrhinus xanthospilus* Shuck. ♀.
8. *Æolothynnus crenulatus*, sp. n. ♂.
Fig. 9. *Pogonothynnus vestitus* Sm. ♂.
10. *Pogonothynnus vestitus* Sm. ♀.
11. *Zaspilothynnus radialis*, sp. n. ♂.
12. *Zaspilothynnus gilesi*, sp. n. ♂.
13. *Zaspilothynnus gilesi*, sp. n. ♀.
14. *Zaspilothynnus clelandi*, sp. n. ♂.
15. *Zaspilothynnus clelandi*, sp. n. ♀.

PLATE XXXII.

Fig. 1. *Ephutomorpha gilesi*, sp. n. ♂.
2. *Ephutomorpha gilesi*, sp. n. ♀.
3. *Ephutomorpha perelegans*, sp. n. ♀.
4. *Anthobosca gilesi*, sp. n. ♂.
5. *Pseudagenia fasciata* Fabr. ♀.
6. *Cryptocheilus darwinii*, sp. n. ♀.
7. *Anoplius atavus*, sp. n. ♀.
8. *Anoplius senex*, sp. n. ♀.
Fig. 9. *Planiceps aureovestitus*, sp. n. ♀.
10. *Ceropales tenuatus*, sp. n. ♀.
11. *Paracrabro froggatti* Turn. ♀.
12. *Ammophila* (*Parapsammophila*) *eremophila*, sp. n. ♂.
13. *Cerceris gilesi*, sp. n. ♂.
14. *Bembex aureofasciata*, sp. n. ♂.
15. *Auchenophorus coruscans* Turn. ♀.

2. Descriptions of new LYCÆNIDÆ and HESPERIIDÆ from Tropical West Africa. By HAMILTON H. DRUCE, F.L.S., F.Z.S., &c.

[Received December 13, 1909.]

(Plates XXXIII.–XXXV.* and Text-fig. 36.)

The following descriptions are of new forms of butterflies contained in the rich collections recently made by Mr. G. L. Bates in the Cameroons and by Mr. P. Landbeck in the upper Kasai district of the Congo.

LYCÆNIDÆ.

TELIPNA TRANSVERSTIGNA, sp. n. (Plate XXXIII. fig. 2, ♀.)

Female. Upper side: both wings dark orange-red with black apices and margins. Fore wing with a large pure white subapical patch. Under side pale brownish yellow, with the usual black markings and white spots, and in addition to these on the hind wing, arising from the base and from the anal margin near the base, are two prominent black bars running almost at right angles to the black costal bars.

Expanse $2\frac{1}{10}$ inches.

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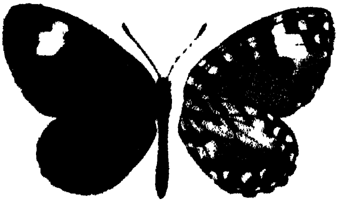
* For explanation of the Plates see p. 378.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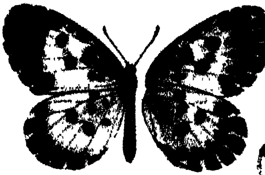
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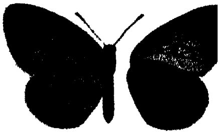
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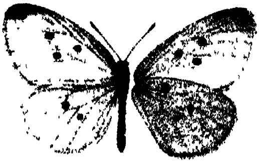
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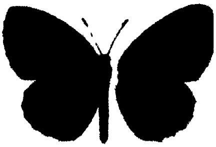
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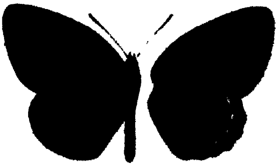
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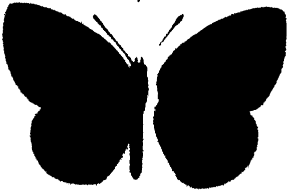
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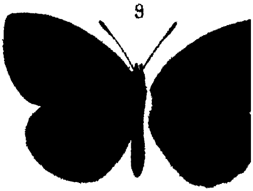
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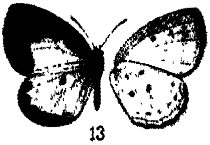
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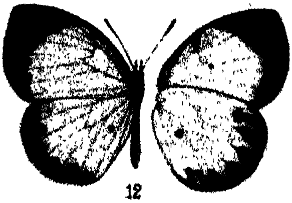
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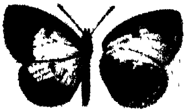
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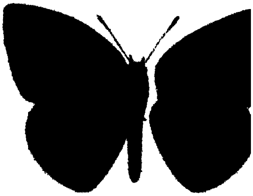
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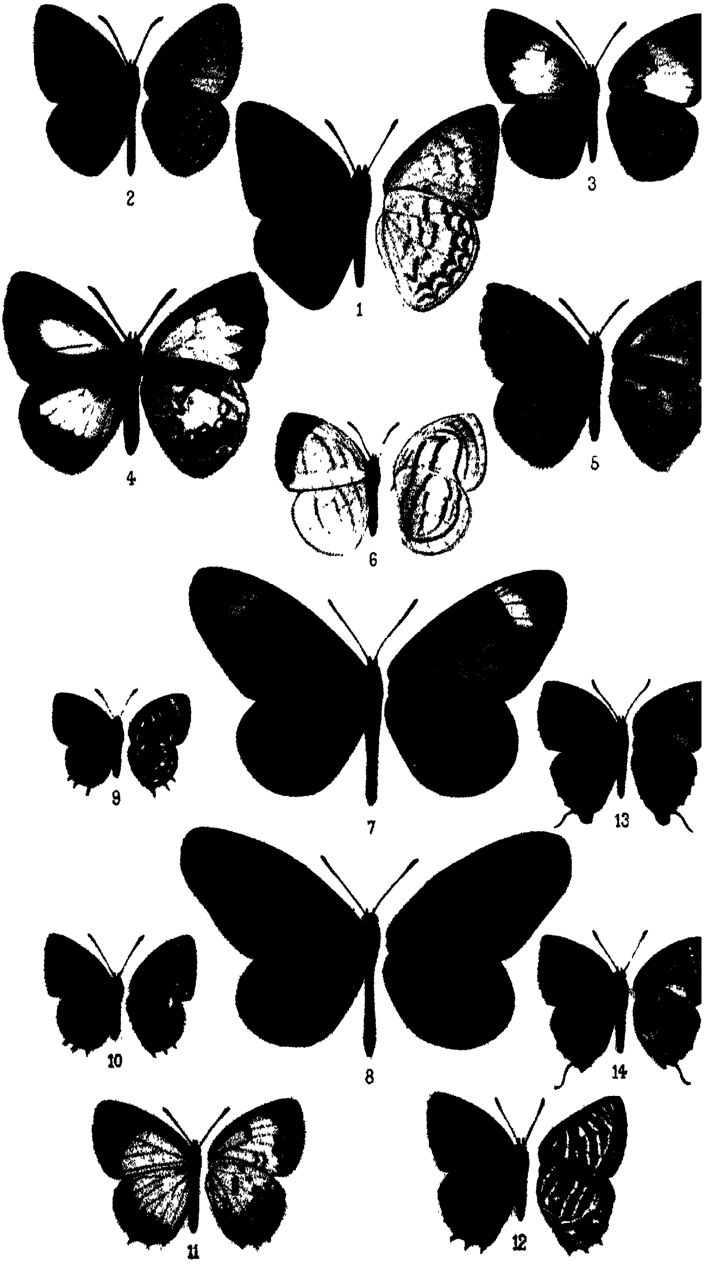
Horace Knight del.et lith.

West, Newman



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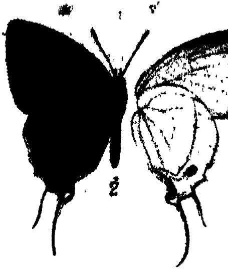

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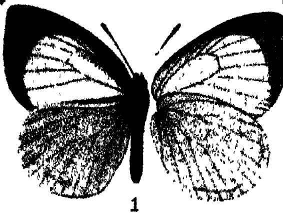

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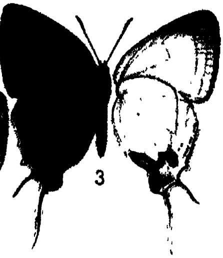

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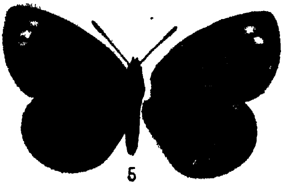

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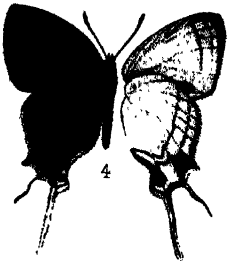

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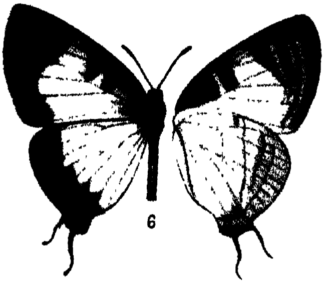

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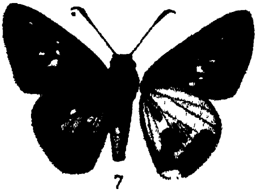

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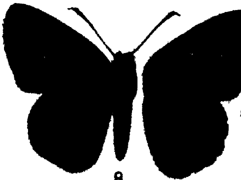

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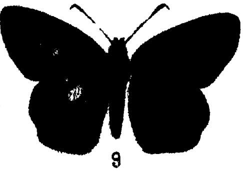

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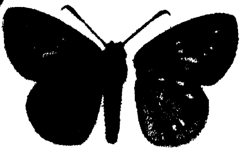

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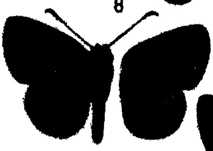

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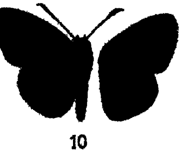

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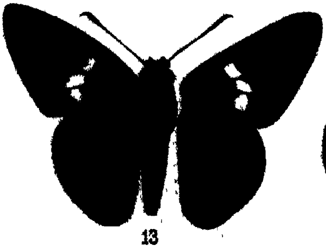

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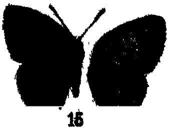

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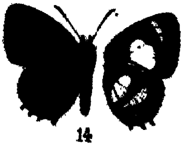

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Horace Knight del. et lith.

West, Newman chr.

Hab. Bitje, Ja river, Cameroons, 2000 ft., wet season (*G. L. Bates*).

Type, Mus. Druce.

The markings on the under side of the hind wing give this insect a very different appearance from any other described in the genus.

Pentila pardalena, sp. n. (Plate XXXIII. fig. 1, ♂.)

Male. Upper side: both wings pale yellow, darker towards the base, heavily spotted with black over the cellular and discal areas; apex and outer margins broadly black, containing rows of pale yellow spots. Under side clear pale yellow, darker on the hind wing and towards base of fore wing. Discal and cellular black spots as above, except on the hind wing where there are several additional black basal spots. The apex and outer margin have a marginal and a submarginal row of large elongated black spots running alternately.

Expanse $1\frac{7}{10}$ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

This is a more heavily spotted form than *Pentila christina* Suffert* (a photograph of the type of which I have before me) and the ground-colour below is clear, not speckled as in that insect.

Pentila inconspicua, sp. n. (Plate XXXIII. fig. 3, ♀.)

Female. Upper side: allied to *Pentila petrea* Hew., paler and without the reddish tinge. In the fore wing the dark apical border is much broader, and there is an additional black spot on the disc situated near the base of cell 2. On the hind wing there is trace of a submarginal row of small black spots situated between the veins, which in some specimens is clearly indicated. Under side: differs from that of *P. petrea* by the addition of the black spot in cell 2, by the absence of the two black spots at the angle in the fore wing, and by the submarginal row of spots on the hind wing being placed further in from the margin.

Expanse $1\frac{3}{10}$ inch.

Hab. Upper Kasai district, Congo Free State, Uganda.

Type, Mus. Druce.

This insect is even paler than *P. preussi* Staud., a large series of which we have received from the same locality.

The British Museum collection contains six specimens from Entebbe, Uganda.

Pentila paradoxa, sp. n. (Plate XXXIII. fig. 4, ♂.)

Male. Upper and under sides: both wings semitransparent, creamy white, without markings. Basal third of costal margin of fore wing on both surfaces grey. When held at an angle the whole of the upper and under surfaces is suffused with a greenish opalescence which is most pronounced over the discal areas. Abdomen black above, pale brown below; legs pale brown, transparent. Antennæ black.

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* *Pentila christina* Suffert, 'Iris,' xvii. p. 45 (1904).

Expanse 1¼ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

Described from two specimens which are identical. It is allied to *P. tirza* Hew.* which has a black costal margin and apex.

The wings of this insect are so transparent that it is possible to read the printed locality label through them.

PENTILA BITJE, sp. n. (Plate XXXIII. fig. 5, ♂.)

Male. Upper side: both wings uniform pale cream; semi-transparent. Fore wing with the apex narrowly fuscous, and the costal margin dusted with fuscous scales; three clearly defined circular black spots on the disc, placed as follows: one in the centre of the cell, one at the end of the cell, and one in cell 2 rather before its middle. Hind wing also with three black spots, placed, one on the costal margin before the middle, above the cell, one at the end of the cell, and one in cell 2 near its base. Cilia concolorous with wings. Under side as above excepting that the fore wing is without the dark apex and that the whole area of both wings is slightly dusted with fuscous scales. Abdomen fuscous above, pale below. Palpi and legs ochreous.

Female. Marked exactly as the male.

Expanse 1½ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry and wet seasons (*G. L. Bates*).

Types, Mus. Druce.

Described from seven specimens. The black spot in cell 2 of the hind wing is very minute in several examples, and in two is entirely wanting, but on one wing only.

There is also a specimen in the British Museum from the Cameroons.

MIMACRÆA LANDBECKI, sp. n. (Plate XXXIV. figs. 7 ♂, 8 ♀.)

Male. Upper side: fore wing dull blackish brown, with the inner marginal area brownish ochreous, shading paler and decreasing in width to vein 4. A pale yellow, slightly ochreous edged, subapical band placed rather more than half-way between the end of the cell and the apex and crossed by the brown nervules. Hind wing brownish ochreous, gradually merging into a brownish black apical and outer marginal area; inner margin, excepting extreme edge which is pale yellow, fuscous. Under side: fore wing—costal area to subapical band black,

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* *Pentila tirza* Hew., Ent. Mo. Mag. x. p. 125 (1873).

inner marginal area broadly ochreous; apical area with the veins and interspaces dusted with rows of ochreous scales. Hind wing: ground-colour blackish brown, thickly dusted with reddish ochreous scales over the cellular and basal areas, and arising from the cell are a number of narrow ochreous lines composed of dusted scales, which before they reach the margin become divided into two. The basal area supports ten deep black spots, most of which are distinctly ringed with ochreous; one is placed at the extreme base, two are above the cell, two in the cell, another partly closing the cell, and four below. Palpi black. Head black, with the eyes white-ringed. Abdomen ochreous fuscous, with a black spot on each segment below. Legs black with white spots. Antennæ black.

Female. Differs from the male in that the subapical band on the fore wing is the same shade of reddish ochreous as the inner marginal area and the hind wing. On the fore wing the ochreous area is more compact, and does not extend so near to the base, and on the hind wing the dark apical area is much broader and the conspicuous dusting of the male is absent, whilst the veins for some distance into the dark area are ochreous, those in the male being fuscous well into the ochreous area. On the under side it differs only from that of the male by the less extensive ochreous area and the concolorous subapical band on the fore wing.

Expanse, male $2\frac{3}{8}$ inches, female $2\frac{7}{10}$ inches.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Types, Mus. Druce.

I thought this might be *M. darwinia* Butl.,* the figure of which appears to be a female, but it is entirely without the yellow fascia on the hind wing below described by Dr. Butler. The type of *M. darwinia* is now in the Tring Museum.

Although obviously Acræine in appearance I am unable to find any species in that group which it is exactly like.

PSEUDERESIA MINIUM, sp. n. (Plate XXXIII. figs. 6 ♂, 7 ♀.)

Male. Upper side: fore wing uniform dark blackish brown, without markings. Hind wing bright orange-red with the apex and outer margin broadly and evenly dark brown; the inner margin is narrowly and evenly dark brown. The basal area has several elongate dark brown markings, some of which are confluent. Cilia whitish, brown at the termination of the nervules. Under side: both wings silvery brown, with the central areas shading to dark brown. Fore wing with a brown mark in the middle of the cell and another, larger, at the end. Hind wing with several small red spots near the base, and a curved discal band of five bright red spots, commencing on the costa and reaching almost to the inner margin. Thorax and abdomen black above, paler below. Legs black, with white spots.

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* *Mimacræa darwinia* Butl. Lep. Ex. p. 104, pl. 38. fig. 8 (1872). Sex not stated.

Palpi fuscous, with black tips. Antennæ black with white spots.

Female. Upper side: differs from the male by the inner marginal area being heavily marked with orange-red, up to and beyond the end of the cell, to which are joined two orange patches, one in the cell, the other just beyond. On the under side, the orange-red patch is divided by a large brown spot; otherwise as above. Hind wing as in male.

Expanse, male $1\frac{3}{10}$ inch, female $1\frac{1}{10}$ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Types, Mus. Druce.

Allied to *Pseuderesia isca* Hew.,* but differently marked.

PSEUDERESIA RUTILO, sp. n. (Plate XXXIII. fig. 9, ♂.)

Male. Allied to the preceding *P. minium*, but much smaller. Upper side differs from that species by the inner margin of hind wing being broadly bordered with dark brown blotches, from the base to the anal angle. The under side differs from that of *P. minium* by the brown shading over the central areas being more extensive and by the possession of one red spot on the discal area of the hind wing, placed at the end of the cell. There are also several minute red dots near the base and one in cell 1.

Expanse 1 inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., wet season (*G. L. Bates*).

Type, Mus. Druce.

This may prove to be a variety of *P. minium*, but the under side of the hind wing is so differently marked that for the present I prefer to consider it distinct. It is also a much smaller insect.

PSEUDERESIA RUSSULUS, sp. n. (Plate XXXIII. fig. 8, ♂.)

Male. Upper side: fore wing clear orange-red; the basal and apical areas broadly dark brown, tapering to a point at the angle. Cell wholly dark brown. Hind wing clear orange-red, a black streak partially closing the cell; basal, inner and outer marginal borders rather broadly dark brown. Cilia of fore wing brown, of hind wing whitish between the nervules. Under side: fore wing—costa, apex and outer margin dull brownish yellow, dusted with dark brown scales, thickest on the veins; basal area black, with several deeper spots in the cell; discal area orange-red, becoming paler towards the inner margin; a subapical black band reaching across the wing. Hind wing brownish yellow, dusted with brown along the costa; basal area with eight distinct black spots of varying sizes; an irregular submarginal black band enclosing a row of whitish triangular lunules, and a marginal row of yellow lunules. Thorax and abdomen brown above, yellowish below. Legs black with white spots. Palpi black, with white hairs.

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* *Liptena isca* Hew., Exot. Butt. v. *Pent. & Lipt.* pl. 2. figs. 14-16 (1873).

Expanse $1\frac{7}{10}$ inch.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Type, Mus. Druce.

Not very nearly allied to any other species of the genus.

LARINOPODA SPUMA, sp. n. (Plate XXXIII. fig. 12, ♂.)

Male. Upper side: fore wing cream-colour, darker than *L. lircæa* Hew.*, with the costa very narrowly and the apex and outer margins rather broadly and unevenly blackish brown; a slight indication of a blackish-brown tooth on the costa opposite the end of the cell. Hind wing cream, with the black spots of the under side showing through; outer margin rather broadly blackish brown, inwardly dentate. Cilia of both wings creamy. Under side cream-colour; fore wing with the apex and outer margin blackish brown as on upper side, the costa, from the base to the clearly defined black tooth on the costa, dusted with blackish brown. Hind wing with outer margin brown as on upper side, inwardly bordered with a submarginal row of darker brown large spots. A small black spot near the centre of cell 1. Thorax fuscous above. Abdomen cream above and below. Legs yellow dusted with black scales. Palpi yellow tipped with black.

Female. Differs from the male by the dark margins of both wings being narrower and paler on both surfaces.

Expanse, male $1\frac{7}{10}$, female $1\frac{1}{2}$ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry and wet seasons (*G. L. Bates*).

Types, Mus. Druce.

Described from eight specimens. Amongst the wet season examples is a female in which the dark outer margin of the hind wing on both surfaces is reduced to an anteciliary line, and on the under side the submarginal row of spots is almost obsolete as also is the dark apex to the fore wing. May prove to be a form of *L. lircæa*.

LARINOPODA EMILIA Suffert.

Larinopoda emilia Suffert, 'Iris,' xvii. p. 48 (1904); H. H. Druce, Ill. Afr. Lyc. pl. i. figs. 1, 1 *a* (1910).

Hab. Bitje, Ja river, Cameroons, 2000 ft., wet and dry seasons (*G. L. Bates*); Upper Kasai district, Congo Free State (*P. Landbeck*).

We have a series of eighteen specimens from the above localities which agree exactly with an excellent photograph of the type of *L. emilia* in the Berlin Museum.

Possibly this is the same as *L. hermansi* Auriv. †, which I know only from the description, and if so, the latter name has priority.

Ab. *punctata*, ♀. Differs from the typical form on the under side by the apex of the fore wing being but slightly laved with brown, and by the possession on the hind wing of an ultramedian row of black spots varying in intensity and placed between the veins, continuing on from the usual spot on the costa near the apex to the inner margin.

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* *Liptena lircæa* Hew., Exot. Butt. iii. *Pent. & Lipt.* pl. 2. figs. 10, 11 (1866).

† *Larinopoda hermansi* Auriv. Öfvers. Vet.-Akad. Förh. liii. p. 435 (1896).

It is very difficult to arrive at a correct conclusion with regard to the insects of this genus. Professor Poulton has recently received a series from Lagos which contains examples of the broad bordered form (*L. aspidos* mihi), the typical *L. lagyra* Hew., and the form with the submarginal row of spots on the hind wing below, named by me *L. brenda*, from Benin. This latter I am now inclined to consider an aberration. It seems quite possible that there is only one white variable species of *Larinopoda*, as the black cell-spot on the under side of the hind wing of *L. eurema* Plötz is sometimes nearly obsolete, and this spot constitutes its only distinction, specimens from Sierra Leone and from Addah having a broad dark border to the hind wing almost as in *L. aspidos*. It will be interesting to know the result of an examination of the ancillary appendages.

LIPTENA PEROBSCURA, sp. n. (Plate XXXIII. fig. 13, ♀.)

Female. Upper side: fore wing pale creamy white, costa, upper half of cell, apex, and outer margin broadly blackish brown; a small brown spot at the end of the cell. Hind wing pale creamy white; outer margin pale brown divided by the white nervules. The black spot of the under side at the end of the cell showing through the wing. Under side pale creamy white, both wings dusted with fine brown scales, densest towards costal and apical margins of fore wing. Outer margins of both wings with faint submarginal brown lines. Hind wing with an inner line composed of faint brown lunules; a small brown spot near the apex and three near the base. Apical area of fore wing with two semicircular faint brown lines much broken. Cilia of fore wing brown, of hind wing white. Palpi pale yellow. Legs orange.

Expanse 1⅛ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

Near to *L. alluaudi* Mabille *, but differently marked.

LIPTENA NUBIFERA, sp. n. (Plate XXXIII. fig. 14, ♂.)

Male. Upper side: fore wing pure white with the apex and outer margin broadly blackish brown; costal margin narrowly and evenly blackish brown. A dark brown spot at the end of the cell joining the costal border. Hind wing: apex and outer marginal area broadly pale brown; a minute brown spot at the end of the cell. Cilia of both wings brown. Under side: both wings much as above, except that there is a clearly defined submarginal line common to both wings, on the outer margin, composed of white crescent-shaped lunules. On the hind wing there is a dark brown spot near the base, and another, larger, at the end of the cell, and the whole wing is laved with brown, excepting the costal margin which is broadly white. Thorax and abdomen brown above, white beneath. Legs and palpi brown.

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* *L. alluaudi* Mabille, Ann. Soc. Ent. France (6) x. p. 23, pl. 2. fig. 2 (1890).

Female. Differs from the male only by being rather paler.

Expanse 1 inch.

Hab. Bitje, Ja River, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Types, Mus. Druce.

Not closely allied to any with which I am acquainted.

LIPTENA SUBVARIEGATA ALIQUANTUM, subsp. n. (Plate XXXV. fig. 5, ♀.)

Liptena subvariegata Smith & Kirby, Rhop. Exot. i. Lyc. Afr. pl. xi. figs. 3, 4 (1890), ♂.

Male. Differs from the typical form on the under side only. There are on the disk of the hind wing, three clearly defined black spots which are wanting in Cameroon specimens; one, small, near the base in the cell, another, larger, near the end of the cell, and the third, small, resting on vein 1 near its centre.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Type, Mus. Druce.

The *female*, which is a very different looking insect from the male, is dull reddish brown on both wings, with dark brown borders, and the fore wing has a subapical white band divided into three by the brown veins. On the under side the fore wing is as on upper side, with the addition of white spots on the costal and outer margins, whilst the hind wing is marked as in the male described above.

Received along with two males from Upper Kasai district, Congo Free State.

LIPTENA DÆMON, sp. n. (Plate XXXIII. figs. 10 ♂, 11 ♀.)

Male. Upper side uniform dark brown, without markings; fore wing slightly tinged with purple. Cilia fuscous. Under side dark brown; apex of fore wing and outer marginal half of hind wing paler and with some faint grey shadings. Hind wing with four orange spots, two in the cell and two in cell 1 near the base, these latter two centred by black dots. Head, thorax, abdomen, and palpi dark brown. Legs dark brown with pale spots. Antennæ black with white rings.

Female. Upper side: fore wing dark brown, discal area from the base bright orange adjoining a large orange patch beyond end of the cell. An orange spot in the centre of the cell. Hind wing uniform dark brown, paler than in fore wing, with a few orange scales dusted over the end of the cell. Under side: fore wing coloured as above but paler and without the orange spot in the cell; outer margin with a row of pale triangular shades, most prominent towards the apex. Hind wing as in male.

Expanse, male and female, $1\frac{4}{5}$ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*); Upper Kasai district, Congo Free State (*P. Landbeck*).

Types, Mus. Druce.

Described from seven males and one female.

From the description this insect seems to be allied to *L.? o-rubrum* Holland[*], described by its author as a female. The female of *L. dæmon* is strikingly different on the fore wing.

MICROPENTILA CINGULUM, sp. n.

Female. Closely allied to *M. alberta* Staud.[†], from which it does not differ on the upper side, but on the under side the hind wing carries a submarginal row of crescent-shaped lunules in place of a fine line.

Expanse $\frac{9}{10}$ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

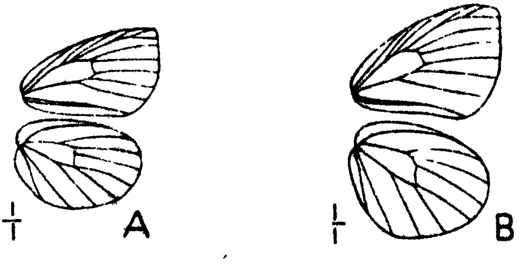
Type, Mus. Druce.

NEAVEIA, gen. n.

Differs from *Deloneura* Trimen by the longer cell in both fore and hind wings and by vein 5 in the fore wing arising from near the middle of the end of the cell, consequently the middle discocellular nervule is present. Vein 1 bears a well-marked brand much as described in *Deloneura millari* Trimen. The fore tarsi are undeveloped, not jointed and without claws, and are spinulose beneath.

Type, *N. lamborni*, sp. n.

Text-fig. 36.



The accompanying woodcuts show the venation of *Poultonia ochrascens* Neave, kindly lent to me by Professor Poulton (text-fig. 36 A), and of *Neaveia* (text-fig. 36 B).

Mr. Trimen has shown (T. E. S. 1906) that *Poultonia* sinks to *Deloneura*.

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[*] *Pseuderesia o-rubrum* Holland, 'Psyche,' v. p. 425 (1890).

[†] *Teriomima alberta* Staud. 'Iris,' iv. p. 220 (1891).

NEAVEIA LAMBORNI, sp. n. (Plate XXXV. fig. 1, ♂.)

Male. Upper side: both wings uniform creamy white with a faint greenish tinge, slightly opalescent at the base of the hind wing. The basal half of the costal margin of the fore wing is pale brown, merging into the blackish-brown apical and outer margins. Under side pale opalescent greenish white without markings, but slightly yellowish over the discal area of fore wing. Cilia of both wings on both surfaces fuscous except towards the apex of the hind wing, where it is white. Thorax clothed with white hairs; abdomen yellowish white above and below. Antennæ black with minute white spots. Palpi deep black, shining, second joint inwardly clothed with pale brown hairs. Legs black with pale brown patches.

Expanse 1⅞ inch.

Hab. Oni, 70 m. east of Lagos, W. Africa (*W. A. Lamborn*)*.

Type, Hope Coll., Oxford University Museum.

The specimen described above has a number of small black spots irregularly placed over the dark apical area of the upper side of the fore wing, but as those on the right wing are not placed in the same position as those on the left wing, I am inclined to believe that they are due to some external cause. The outer margin of the hind wing has, on both surfaces, a few brown scales which seem to point to the fact that it has lost, or is acquiring, a dark marginal border. The insect's Pierine appearance is very marked, and Mr. Lamborn is to be congratulated on a very interesting capture.

EPITOLA BATESI, sp. n. (Plate XXXIV. figs. 2 ♂, 3 ♀.)

Male. Upper side: fore wing uniform rich blue with the apical third evenly deep black. Cilia black, white at the angle. Hind wing uniform rich shining blue, costal margin evenly and broadly dull black; inner margin dark grey. A black anteciliary line, slightly thickened at the extremity of the nervules. Cilia white. Under side silvery ashen grey with pale bluish-grey markings. Both wings with a marginal and a submarginal row of crescent-shaped lunules. Fore wing with a central circular band of markings commencing on the costa where they are small, and continuing to the anal angle where they become large patches. Hind wing: discal area covered by a number of small irregular markings. Thorax and abdomen black above, pale below. Antennæ black above, white-spotted below. Palpi cream, terminal joint black. Legs black with cream spots.

Female. Upper side: fore wing white with the apex and outer margin rather broadly blackish brown; basal area including upper part of cell and costal margin dark grey, more or less suffused with pale blue scales. Inner margin very narrowly grey dusted with pale blue scales. Hind wing uniform dark grey. Cilia paler. Under side as in male, excepting that the white area of the fore wing is reproduced as on upper side.

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* In a letter recently received from Mr. Lamborn he states that he captured this insect in the wet season, at dusk, on the veranda of his house.

Expanse 1⅜ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Types, Mus. Druce.

Near to *Epitola dorothea* Beth.-Baker *, but vein 1 of the fore wing is not heavily thickened and the shape of the wings is different, the outer margin of the fore wing being decidedly concave and the hind wing not angled.

Described from five specimens.

EPITOLA TUMENTIA, sp. n. (Plate XXXIII. fig. 15, ♂.)

Male. Upper side: fore wing dark smoky brown; inner marginal area from base to vein 3 shining blue, not reaching beyond the wall of the cell. The base of vein 2 is much swollen almost to the origin of vein 3. Hind wing suffused with shining blue scales on a smoky ground; costal margin rather broadly, and outer and inner margins narrowly smoky brown. Under side: both wings uniform pale nut-brown with a common central fascia composed of very indistinct greyish spots, beyond which are dusted some greyish scales. Palpi brown, tipped with black. Legs brown with cream spots. Abdomen bluish grey above, brown beneath. Antennæ black above, white-spotted below.

Expanse 1¼ inch.

Hab. Afikpo, N. Nigeria (*Reddick*).

Type, Mus. Druce.

Remarkable for the swollen vein on the fore wing, which is more prominent than in any other species of the genus, excepting perhaps *E. cercene* Hew.†, to which, as also to *E. carcina* Hew.‡, it is allied.

EPITOLA NITIDE, sp. n. (Plate XXXIV. fig. 1, ♂.)

Male. Upper side: fore wing rich shining blue with the costa, apex, and outer margin rather broadly deep black, very narrowly so towards the anal angle. Vein 1 is evenly thickened and covered with deep black scales from its base for rather more than half its length, vein 2 is also thickened and black from its base to the origin of vein 3. Hind wing rich shining blue with the costal margin broadly and evenly black, the inner margin dark grey and the outer margin very narrowly black. Cilia white. Under side white; both wings with an anteciliary line and two submarginal rows of crescent-shaped lunules, pale brown. Fore wing with a pale brown marking closing the cell, beyond which is a crescent-shaped short band composed of pale brown linear markings. The discal area of the hind wing is marked by a number of pale brown striæ irregularly placed. The apical area of the fore wing is slightly clouded. Thorax black above, white below. Abdomen black above, dark grey below. Legs white, dusted and spotted with black. Palpi white, terminal joint, which is long and slender, black. Antennæ black above, white-spotted below.

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* *Epitola dorothea* Beth.-Baker, Ann. Mag. Nat. Hist. ser. 7, vol. xiv. p. 227 (1904).

† *Epitola cercene* Hew. Ent. Mo. Mag. x. p. 150 (1873).

‡ *Epitola carcina* Hew. *l. c.* (1873).

Expanse $1\frac{9}{10}$ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

This is a fine insect which has a very straight outer margin and an acute apex to the fore wing. On the under side it is marked much like *E. goodii* Holland [*], which seems to be the same as *E. gerina* Hewitson [†], whose figure is a very poor one. *E. nitide* is a much larger insect with different shaped wings.

POWELLANA.

Powellana Beth.-Baker, P.Z.S. 1908, p. 114.

POWELLANA COTTONI.

Powellana cottoni Beth.-Baker, P. Z. S. 1908, p. 114, pl. ix. fig. 13, ♂.

Female. Upper side: pale brown with a broad white central band common to both wings. Fore wing with a white costal marking above the end of the cell. The basal area of the fore wing and the whole of the hind wing, except the apex and outer margin, are dusted with pale violet-blue scales. Under side as in male.

Expanse 2 inches.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Type, Mus. Druce.

Mr. G. L. Bates sent a good series of this remarkable insect from Ja river, Cameroons, some males showing faint traces of the white central band described in the female.

Dr. Godman's collection, now in the British Museum, contains a single female from W. Africa, but the precise locality is not stated. It has been there for many years.

BATELUSIA, gen. n.

Allied to *Powellana* Beth.-Baker, from which it differs by veins 10 and 11 in the fore wing arising directly from the cell, not stalked from a short stalk as in that genus.

Type, *Batelusia zebra*, sp. n.

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[*] *Epitola goodii* Holland, 'Psyche,' v. p. 424 (1890).

[†] *Epitola gerina* Hew. Ill. Exot. Butt., Lyc. suppl. p. 19, pl. 1 *b*. figs. 13, 14 (1878).

Batelusia zebra, sp. n. (Plate XXXIV. fig. 6, ♀.)

Female. Upper side: both wings creamy white with the dark lines of the under side showing through. Fore wing with the apex and outer margin rather broadly and evenly blackish brown. Cilia of fore wing fuscous, of hind wing pale brown. Under side creamy white shaded with pale brown, with a series of six dark brown lines of varying intensity common to both wings. A faint submarginal line also common to both wings. Cilia pale brown. Palpi and legs black. Abdomen creamy white.

Expanse $1\frac{3}{10}$ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

This curious little insect, which is very Pierine in appearance, is quite unlike anything known to me.

The type is unique.

Lachnocnema niveus, sp. n. (Plate XXXIV. fig. 4, ♀.)

Female. Upper side: both wings pure white with the costa, apex, and outer margin dark brown; inner margin rather narrowly dark brown, especially in hind wing. Basal areas of both wings slightly suffused with grey. Cilia of both wings fuscous, whitish above apex of hind wing. Under side: fore wing pure white, costa narrowly and evenly, apex and outer margin rather broadly and unevenly grey shaded with reddish brown. Along the costal and outer margin from the base to the anal angle is a row of minute black dots and crescents heavily bordered with silver. Beyond the cell about half-way to the margin are two confluent, oval, dark brown spots, placed one above the other, containing silver ocelli. The hind wing is marked much as in *L. bibulus* Fab.[*] ♀, but the discal area is more distinctly white and the central band is more broken and comparatively smaller. Thorax and abdomen and legs, which are densely hairy, cream colour. Palpi cream, shading to dark brown at tips.

Expanse $1\frac{9}{10}$ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

Described from two specimens which do not differ.

Perhaps nearest to *L. busoga* Beth.-Baker[†], from Busoga, a specimen of which is in the British Museum, but quite distinct. It will be noticed that there are no dark spots closing the cells in this insect.

Lachnocnema luna, sp. n. (Plate XXXIV. fig. 5, ♀.)

Female. Upper side: fore wing rich dark brown with an ochreous discal band crossed by the brown nervules, commencing beyond the cell below vein 6 and extending to vein 1, above which it reaches almost to the base. Cilia distinctly chequered dark brown and cream. Hind wing ochreous, costal half and outer and inner margins rather narrowly dark brown; the veins crossing the ochreous area are not brown as in fore wing. Cilia cream, faintly brown at the termination of the nervules. Under side: fore wing much as in the preceding *L. niveus*, but the discal area yellow suffused with grey scales from the base and between the nervules, a double brown marking closing the cell. Hind wing much as in *L. niveus*, but the discal area cream and all the spots darker brown. Legs and palpi dark fuscous. Abdomen brown above, dark fuscous below.

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[*] *Hesperia bibulus* Fab. Ent. Syst. iii. 1, p. 307 (1793).

[†] *Lachnocnema busoga* Beth.-Baker, Ann. Mag. Nat. Hist. ser. 7, vol. xvii. p. 105 (1906).

Expanse 1$\frac{7}{10}$ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

Seems to be allied to *L. reutlingeri* Holland *, by the colour of the upper surface.

LACHNOCNEMA MAGNA.

Lachnocnema magna Auriv. Ent. Tidskr. xvi. p. 209 (1895).

Arrugia umbra Grose Smith, Rhop. Exot. iii. Afr. Lyc. p. 128, pl. 27. figs. 5, 6 (1901).

Female. Differs from the male only by being slightly paler on both surfaces and by the outer margin of the fore wing being considerably more convex.

Hab. Bitje, Ja river, Cameroons, 2000 ft., wet and dry seasons (*G. L. Bates*); upper Kasai district, Congo Free State (*P. Landbeck*).

Mr. Bates obtained a large series of this insect in the Cameroons which scarcely vary.

RAPALA ANGELITA.

Deudorix angelita Suffert, Iris, xvii. p. 54 (1904).

Deudorix schultzii Auriv. Arkiv Zool. iii. no. 19. p. 2, figs. 37, 38 (1907).

Deudoryx makala Bethune-Baker, P. Z. S. 1908. p. 111, pl. ix. fig. 4.

Hab. Bitje, Ja river, Cameroons, 2000 ft., wet and dry seasons (*G. L. Bates*).

An excellent photograph of Suffert's type (a female) in the Berlin Museum shows that the above synonymy is correct.

DIOPETES KEDASSA, sp. n. (Plate XXXIV. fig. 13, ♂.)

Male. Closely allied to *D. catalla* Karsch †. Upper side less brilliant in hue, and with the apical and outer marginal areas of the fore wing more broadly black. On the hind wing all the veins are distinctly black, which is not the case in *D. catalla*. On the under side the markings are much as in *D. catalla*, but much less prominent.

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* *Lachnocnema reutlingeri* Holland, Ann. Mag. Nat. Hist. ser. 6, vol. x. p. 286 (1892).

† *Diopetes catalla* Karsch, Ent. Nachr. xxi. p. 318 (1895).

Female. On the upper side differs from *D. catalla* ♂ by the entire absence of the purple sheen on the basal and discal areas of both wings. Under side as male but paler.

Expanse, ♂ 1 1/10 inch, ♀ 1 1/5 inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Types, Mus. Druce.

This is a smaller insect than *D. catalla*, a long series of which together with *D. aucta* Karsch * were obtained by Mr. Bates at Bitje. Good photographs of Karsch's types in the Berlin Museum have enabled me to identify these species with certainty.

DIOPETES PASTEON, sp. n. (Plate XXXIV. fig. 14, ♂.)

Male. Upper side dull purple, brilliant only when held at an angle; apical third of fore wing and veins of hind wing black. Under side pale olivaceous brown marked with white shades, but without lines. Fore wing: some white scales in and at the end of the cell; the outer margin is broadly shaded with white and the inner margin is broadly white. Hind wing: discal and inner marginal area thickly shaded with white; a white spot on the glandular patch and some whitish shades on the outer margin. A small black spot near the apex and another, marginal, surrounded with orange in cell 3. An orange spot with a black dot at the extreme apex. Thorax and abdomen purple above, paler below. Legs brown, white-spotted. Palpi brown with white hairs. Antennæ brown, spotted with white.

Expanse 1 1/5 inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

The absence of all lines on the under side at once distinguishes this insect from its allies.

PSEUDALETIS BATESI, sp. n. (Plate XXXV. fig. 6, ♀.)

Female. Upper side: fore wing white with the apex and outer margin broadly blackish brown; costal margin narrowly pale brown. A brown spot in the middle of the cell and another, like it, closing the cell. The basal, cellular, and outer edge of the white discal areas are dusted with yellow scales. Hind wing pure white with the apex and outer margin blackish brown. From the anal angle to vein 2 is an anteciliary black line inwardly dusted with greyish-blue metallic scales. Cilia of both wings brown. Under side: fore wing white; apical area crossed by three indistinct pale brown bands originating on the costal margin and converging to the angle where they become linear. The cell from its base is wholly pale brown excepting towards the end, where it is crossed by a white bar. Outer margin and cilia pale brown. Hind wing white, apical half crossed by four indistinct brown lines which converge near the margin on vein 2 and are thence angled to the anal margin. Anal angle yellow, supporting two black spots on the margin, one on either side of vein 1, also a few metallic greyish scales. Thorax and abdomen brown above, yellow below. Legs and front of head yellow. Anal tuft blackish brown. Tails brown.

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* *Diopetes aucta*, Karsch, Ent. Nachr. xxi. p. 318 (1895).

Expanse 2 inches.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

Nearest to *P. antimachus* Staud.*

EPAMERA NEAVEI, sp. n. (Plate XXXV. fig. 4, ♂.)

Male. Upper side rich cerulean blue, colour of *E. laon* Hew. Fore wing with apical half deep black. Hind wing with apex very narrowly and evenly black; large shining patch dark grey. Lobe black, crowned with orange and dusted with rich blue scales. Cilia of fore wing fuscous, of hind wing pure white. Tail on vein 1, which is much longer than usual in this genus, pure white; tail on vein 2 black, tipped with white. Under side pure white. Fore wing with apex and outer margin rather narrowly shaded with brown; a faint submarginal brown line followed by a clearly defined brown line: the inner margin is broadly shining white and has attached to its edge a large tuft of long blackish hairs. Cilia white, tipped with black. Hind wing with a black anteciliary line followed by two brown lines as described in the fore wing, the innermost angled above the lobe to the inner margin. Near the margin between veins 2 and 3 is a large black spot surrounded by orange, which orange is continued in a very irregular line to the inner margin. Lobe black, inwardly bordered with red on which are dusted violet scales. Cilia pure white. Thorax and abdomen rich blue above; white below. Legs white; the tarsi spotted with black. Antennæ black and white spotted; palpi white with black tips. Head bright orange.

Expanse 1½ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft. (*G. L. Bates*).

Type, Mus. Druce.

This beautiful insect is not nearly allied to any with which I am acquainted, but by the shape of the wings and by the possession of the long tail on vein 1 of the hind wing it seems to be near *Tanuetheira timon* Fab.[*], but unlike that species has only four branches to the subcostal nervure in the fore wing.

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* *Pseudaletis antimachus* Staud. Exot. Schm. i. p. 276, pl. 95 (1888).

I have named it after Mr. S. A. Neave, whose researches in the Congo regions have already revealed so many new forms of insects.

EPAMERA SIBELLA, sp. n. (Plate XXXV. fig. 2, ♂.)

Male. Closely allied to *E. bellina* Plötz, from which it differs by the upper side being violaceous blue without the greenish reflections, by the large shining patch on the hind wing being paler, and by the almost total absence of the black at the anal angle of the hind wing. On the under side the orange areas near the anal angle are much less extensive and do not reach the black line above the lobe. The front of the head is bright orange.

Expanse 1½ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

I have compared this insect with the type of *E. iaspis*[†], which according to Prof. Aurivillius equals *E. bellina* Plotz[‡]. The orange head distinguishes it at once. In that respect it is like *E. iasis* Hew.[§]

EPAMERA GEMMARIUS, sp. n. (Plate XXXV. fig. 3, ♂.)

Male. Closely allied to *E. sappirus* mihi[‖]. Differs in the shade of blue which closely approaches that of *E. laon* Hew., in the much less concave inner margin of the fore wing, and by the reduced area of the shining patch on the hind wing. On the under side the ground-colour is whiter, but the markings, though paler throughout, are the same as in *E. sappirus*. The front of the head is white.

Expanse 1½ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

This may prove to be a varietal form of *E. sappirus*, but the totally different colour and different shaped inner margin to the fore wing seem to point to another insect.

SPINDASIS LEONINA BITJE, subsp. n.

Zeritis leonina E. M. Sharpe, Ann. Mag. Nat. Hist. ser. 6, vi. p. 104 (1890); id. Trans. Ent. Soc. 1890, pl. xviii. fig. 5.

Male. Differs from the typical form by the orange on the fore wing spreading along the inner margin almost to the angle and upwards to the cell. On the under side the outer margins of both wings are entirely without the broad orange bands.

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[*] *Papilio timon* Fab. Mant. Ins. ii. p. 65 (1787).

[†] *Iolaus iaspis* H. H. Druce, Ann. & Mag. Nat. Hist. ser. 6, vol. v. p. 30 (1890).

[‡] *Iolaus bellina* Plötz, S. E. Z. xli. p. 200 (1880).

[§] *Iolaus iasis* Hew. Ill. Diur. Lep., Lyc. p. 42, pl. xix. figs. 11, 12 (1865).

[‖] *Epamera sappirus* H. H. Druce, P. Z. S. 1902, p. 117, pl. xii. fig. 1.

Female. On the upper side the orange area of the fore wing is more extensive than in the typical form and the hind wing is entirely orange, excepting at the base. Under side as male.

Hab. Bitje, Ja river, Cameroons, 2000 ft., wet and dry seasons (*G. L. Bates*).

Mr. Bates obtained a good series of this species, all of which differ from the typical form as described above.

LYCÆNESTHES.

The new forms in this genus described here and the two following have been submitted to Mr. Bethune-Baker, who has lately written a monographic revision of the African species of this group, and he agrees with me that they are undescribed.

LYCÆNESTHES MIMETICA, sp. n. (Plate XXXIV. fig. 11, ♀.)

Female. Upper side pure white; apical half and costal border of fore wing dark brown; hind wing with outer margin dark brown supporting a marginal row of triangular black spots ringed with pure white and of varying size, the two largest being placed between veins 2 and 3, and 3 and 4. A dark brown anteciliary line. Cilia of both wings brown. Under side: fore wing white; apex and outer margin pale brown with a marginal and submarginal row of slightly dark lunules. A double brown mark closing the cell, and another, broader, near the centre of cell 1. Hind wing white, the apex and outer margin brown as on fore wing and with the marginal row of lunules as described on the upper side, the two larger ones only being black; at the extreme anal angle is a small orange spot. A double brown mark closing the cell. A small black spot near the centre of the costal margin, another near the base, and a third on the extreme anal margin towards the base. Thorax and abdomen brown above, white below. Legs black and white, Palpi white with black tips. Antennæ black, ringed with white.

Expanse 1⅖ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

Not closely allied to any described species.

LYCÆNESTHES BITJE, sp. n. (Plate XXXV. fig. 15, ♂.)

Male. Upper side dark brown; fore wing with a rather large discal ovular orange spot; hind wing with an ultra-medial orange fascia, a pale anteciliary line, and a black, red-crowned marginal spot in cell 2. Under side pure white, with comparatively few brown markings and those broad and clearly defined. Fore wing: a long cellular streak, a broad band crossing the cell and reaching the inner margin, a dentate spot closing the cell and another opposite to it on the inner margin, an ultra-median band meeting a submarginal band at vein 3, and a fine marginal line. Cilia brown. Hind wing: a broad basal streak, several spots and patches on the discal area, and a submarginal brown band; an anteciliary brown line; cilia whitish. In cell 2 is a marginal black spot surrounded with orange and dusted with metallic blue scales. There is also a small black spot at the extreme anal angle with a few metallic scales. Thorax and abdomen brown above, pale below.

Expanse 1 inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., wet season (*G. L. Bates*).

Type, Mus. Druce.

Somewhat like a small *L. zenkeri* Karsch * (Pl. XXXV. fig. 14, ♂) on the upper side but quite different below.

LYCÆNESTHES BAKERI, sp. n. (Plate XXXIV. fig. 12, ♀.)

Female. Allied to *L. makala* Beth.-Baker. Upper side rich orange; fore wing with costal and outer margins more broadly dark brown; a brown linear marking at the end of the cell, confluent with the brown costal margin. Under side with brown patches and white bands arranged much as in *L. makala* but much less in number; the whole discal area of the fore wing and the anal half of the hind wing having a rich orange ground-colour. Four internervular black marginal spots at the anal angle dusted with pale blue scales. Thorax and abdomen brown above, pale below. Legs black and white. Palpi white, with black hairs and tip.

Expanse $1\frac{3}{10}$ inch.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Type, Mus. Druce.

I thought this might be the female of *L. makala*, but it presents such differences from that species, several specimens of which we have received from the same locality, that Mr. Bethune-Baker writes me that it is certainly distinct.

TRICLEMA INCONSPICUA, sp. n. (Plate XXXIV. fig. 9, ♂.)

Male. Upper side uniform dark smoky brown, without markings. Under side: ground-colour dark brown with pure white bands arranged much as in *L. lacides* Hew. †, but all much broader.

Expanse 1 inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

Distinguished by the pure white broad bands on the under side.

Mr. Bates also obtained *L. lacides* at the same place and season.

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* *Lycænesthes zenkeri* Karsch, Ent. Nachr. xxi. p. 298 (1896).

† *Lycænesthes lacides* Hew. Trans. Ent. Soc. 1874, p. 348.

TRICLEMA OBSCURA, sp. n. (Plate XXXIV. fig. 10, ♂.)

Male. Upper side brownish black, with an inconspicuous dull shining purple patch over the central area of the inner margin of the fore wing and over the whole of the discal area of the hind wing. On the hind wing near the apex is a faint pale marking corresponding with the white patch on the under side. On the under side the ground-colour is rich brown with darker patches and pure white bands and marks arranged much as in *T. staudingeri* Smith and Kirby * but narrower. Thorax and abdomen brown above and with some whitish hairs below.

Expanse $1\frac{1}{10}$ inch.

Hab. Bitje, Ja river, Cameroons, 2000 ft., dry season (*G. L. Bates*).

Type, Mus. Druce.

HESPERIIDÆ.

SARANGESA LUNULA, sp. n. (Plate XXXV. fig. 8, ♂.)

Male. Upper side: fore wing dark olivaceous brown with semihyaline white spots arranged as follows: a double spot closing the cell, five subapical spots, a linear marking at the base of cell 3, a crescent-shaped spot in cell 2, and two minute dots in cell 1 placed one above the other. Hind wing olivaceous brown with paler shades and darker brown blotches placed irregularly over the discal and basal areas. Cilia of both wings fuscous with some whitish patches. Under side paler than above. Fore wing with spots as on upper side and an additional white dot near the centre of cell 1. There is also some pale yellow shading near the angle, beyond the white dots. Thorax and abdomen brown above and below. Palpi thickly clothed with black and yellow hairs.

Female. Differs from the male by being paler and by the spots on the fore wing being rather larger, and by the cilia of the hind wing being distinctly chequered yellow and brown. The minute dot near the middle of cell 1 of the fore wing, which is absent in most specimens of the male sex, is usually clearly seen on both surfaces in the female.

Expanse, ♂ ♀, $1\frac{7}{10}$ inch.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Types, Mus. Druce.

Described from three males and five females.

The curious crescent-shaped mark in cell 2 of the fore wing should distinguish this insect from all others in the genus.

EAGRIS LANDBECKI, sp. n. (Plate XXXV. fig. 9, ♀.)

Female. Upper side: fore wing dark olivaceous brown; a minute semihyaline white costal spot opposite the end of the cell; two larger spots, within and near the end of the cell; three minute subapical spots and a discal series of spots placed in cells 1–5, that in cell 2 being the largest. Hind wing dark olivaceous brown, paler over the discal area; three semihyaline white spots, the centre of which is much the largest, near the base, and beyond these an ultramedian row of distinct black spots, from the costa to the anal margin. Cilia of both wings brown; some whitish scales between veins 5–7. Under side: both wings exactly as above and but slightly paler. Thorax brown above, clothed with yellow hairs below. Palpi brown above, thickly clothed with yellow hairs below. Abdomen brown above, pale below. Legs yellowish. Antennæ brown.

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* *Lycænesthes staudingeri* Smith & Kirby, Rhop. Exot., African Lycænidæ, p. 112, pl. xxiv. figs. 9, 10 (1894).

Expanse 1½ inch.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Type, Mus. Druce.

Distinguished at once by the semihyaline basal spots on the hind wing.

OXYPALPUS NIGER, sp. n. (Plate XXXV. fig. 10, ♂.)

Male. Upper side rich dark brown. Fore wing with a small patch of reddish ochreous scales towards the centre of the inner margin. Hind wing with two reddish ochreous lines radiating from the base towards the inner margin. Cilia of both wings dark brown. Under side, both wings: ground-colour dark brown, thickly suffused with dark reddish ochraceous excepting over the cell and inner margin of fore wing. Thorax clothed with ochreous hairs above and below. Abdomen brown above, yellow below. Legs yellow.

Expanse 1$\frac{1}{16}$ inch.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Type, Mus. Druce.

Quite unlike any other species in the genus.

PARDALEODES NEVEA, sp. n. (Plate XXXV. fig. 7, ♂.)

Male. Allied to *P. ligora* Hew.* Upper side: fore wing dark olivaceous brown with one subapical white semitransparent spot only, two at the end of the cell, a series of three placed on the disc in cells 1, 2, 3, that in cell 1 being very small. Cilia brown. Hind wing dark olivaceous brown, with the central semitransparent patch, which in *P. ligora* is yellow, pure white and almost divided into two by a broad brown tooth projecting upwards from the brown border. Cilia fuscous excepting towards anal angle, where they are pure white. The under side differs from that of *P. ligora* by the absence of the subapical pale patch on the fore wing and the pale yellow shading on the white ground and cilia. Abdomen pure white above and below except the anus, which is dark brown.

Expanse 1⅜ inch.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Type, Mus. Druce.

The apex of the fore wing is less produced in this insect than in *P. ligora*, and I have no doubt it represents a distinct species.

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* *Hesperia ligora* Hew. Ann. Mag. Nat. Hist. ser. 4, vol. xviii. p. 450 (1876).

CERATRICHIA AUREA, sp. n. (Plate XXXV. figs. 11 ♂, 12 ♀.)

Male. Upper side: fore wing dark brown with a series of about nine semitransparent pale yellow spots placed almost in a circle; two large ones at the end of the cell, one each in cells 2, 3, 4, the rest, which are smaller, being placed on the costa and beyond the end of the cell; the base of the costa as also the base of the inner margin and discal area up to the cell-wall is dark ochreous. Hind wing dark ochreous with rather less than the costal half dark brown. Under side—fore wing: costal and apical areas dark ochreous, the series of circular spots as above, four subapical silvery spots bordered with dark brown; on the centre of discal area below the series of spots is a large pale yellow patch; the rest of the wing is brown. An anteciliary brown line. Cilia ochreous, tipped with fuscous. Hind wing ochreous with a number of irregular silver spots narrowly margined with brown. Cilia ochreous. Thorax thickly covered with ochreous hairs. Abdomen ochreous, slightly fuscous at the base of each segment. Legs ochreous spotted with fuscous.

Female. Upper side: fore wing differs from that of male by the costal and discal areas being without the ochreous, and on the hind wing the ochreous area is much reduced and paler. Under side: fore wing much as above and slightly yellowish towards centre of inner margin. Hind wing marked as in male, pale yellow, and with costal margin broadly brownish.

Expanse, ♂ ♀, $1\frac{3}{8}$ inch.

Hab. Upper Kasai district, Congo Free State.

Types, Mus. Druce.

Nearest to *Ceratrichia argyrosticta* Plotz *, but the arrangement of the semihyaline spots is quite different.

CÆNIDES ARTOPTA, sp. n. (Plate XXXV. fig. 13, ♂.)

Male. Allied to *C. cœnira* Hew. †

Upper side differs by the central pearly white band on the fore wing being much narrower, divided into three spots by the brown veins, the spot in cell 1 being the smallest. The three subapical spots are not in a line as is usual in *C. cœnira.* On the under side the fore wing is marked as above and is laved with pinkish towards the apex, but is without the yellow costal patch of *C. cœnira.* The hind wing is wholly brown, the basal two-thirds being darkest. Thorax and abdomen brown above and below. Legs brown. The sides of the palpi and the hairs around the eyes are white; the fronts of the palpi are dark brown, thickly sprinkled with white hairs. Head brown.

Expanse $2\frac{1}{10}$ inches.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Type, Mus. Druce.

Distinguished at once by the dark under side of hind wing.

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* *Apaustus argyrosticta* Plötz, S. E. Z. vol. xl. p. 358 (1879)

† *Hesperia cænira* Hew. Exot. Butt. vol. iv. *Hesperia*, pl. ii. figs. 15, 16 (1867).

CÆNIDES CEUCÆNIRA, sp. n.

Male. Closely allied to *C. cœnira* Hew.

Upper side paler and with the pearly white fascia on the fore wing much narrower and divided by brown veins. On the under side the pale area of the hind wing is much more extensive and without the pink shading towards the apex. Thorax, abdomen, palpi and legs dark brown.

Expanse 2⅜ inches.

Hab. Upper Kasai district, Congo Free State (*P. Landbeck*).

Several specimens of the typical *C. cœnira* were contained in the same collection.

EXPLANATION OF THE PLATES.

Plate XXXIII.

Fig.
1. *Pentila pardalena*, sp. n., ♂, p. 357.
2. *Telipna transverstigna*, sp. n, ♀, p. 356.
3. *Pentila inconspicua*, sp. n., ♀, p. 357.
4. ,, *paradoxa*, sp. n., ♂, p. 357.
5. ,, *bitje*, sp. n., ♂, p. 358.
6. *Pseuderesia minium*, sp. n., ♂, p. 359.
7. „ „ ♀, p. 360.

Fig.
8. *Pseuderesia russulus*, sp. n., ♂, p. 360.
9. „ *rutilo*. sp. n., ♂, p. 360.
10. *Liptena dæmon*, sp. n., ♂, p. 363.
11. „ „ ♀, p. 363.
12. *Larinopoda spuma*, sp. n., ♂, p. 361.
13. *Liptena perobscura*, sp. n., ♀, p. 362.
14. „ *nubifera*, sp. n., ♂, p. 362.
15. *Epitola tumentia*, sp. n., ♂, p. 366.

Plate XXXIV.

Fig.
1. *Epitola nitide*, sp. n., ♂, p. 366.
2. „ *batesi*, sp. n., ♂, p. 365.
3. „ „ ♀, p. 365.
4. *Lachnocnema niveus*, sp. n., ♀, p. 368.
5. „ *luna*, sp. n., ♀, p. 368.
6. *Batelusia zebra*, sp. n., ♀, p. 368.
7. *Mimacræa landbecki*, sp. n., ♂, p. 358.

Fig.
8. *Mimacræa landbecki*, ♀, p. 359.
9. *Triclema inconspicua*, sp. n., ♂, p. 374.
10. „ *obscura*, sp. n., ♂, p. 375.
11. *Lycænesthes mimetica*, sp. n., ♀, p. 373.
12. „ *bakeri*, sp. n., ♀, p. 374.
13. *Diopetes kedassa*, sp. n., ♂, p. 369.
14. „ *pasteon*, sp. n., ♂, p. 370.

Plate XXXV.

Fig.
1. *Neaveia lamborni*, sp. n., ♂, p. 365.
2. *Epamera sibella*, sp. n., ♂, p. 372.
3. „ *gemmarius*, sp. n., ♂, p. 372.
4. „ *neavei*, sp. n., ♂, p. 371.
5. *Liptena subvariegata aliquantum*, subsp. n., ♀, p. 363.
6. *Pseudaletis batesi*, sp. n., ♀, p. 370.
7. *Pardaleodes nevea*, sp. n., ♂, p. 376.

Fig.
8. *Sarangesa lunula*, sp. n., ♂, p. 375.
9. *Eagris landbecki*, sp. n., ♀, p. 375.
10. *Oxypalpus niger*, sp. n., ♂, p. 376.
11. *Ceratrichia aurea*, sp. n., ♂, p. 377.
12. „ „ ♀, p. 377.
13. *Cænides artopta*, sp. n., ♂, p. 377.
14. *Lycænesthes zenkeri*, Karsch, ♂, p. 374.
15. „ *bitje*, sp. n., ♂, p. 373.

3. On certain Subcutaneous Fat-Bodies in Toads of the Genus *Bufo*. By C. L. Boulenger, M.A., F.Z.S., King's College, Cambridge.

[Received January 10, 1910.]

(Text-figures 37 & 38.)

I. *Introductory.*

Some little while ago, when engaged in dissecting some African toads of the genus *Bufo*, Mr. E. Degen, F.Z.S., noticed that certain specimens possessed curious gland-like deposits of fat between the skin and ventral body-wall of the abdominal region. He was so kind as to call my attention to these structures, and I came to the conclusion that it would be of interest to more fully investigate this point in Batrachian anatomy.

Examination of specimens of *Bufo regularis* obtained by Dr. Cunnington and myself from the Fayûm province of Egypt showed similar fat-bodies to be present in this species and induced me to examine other allied toads, many of which were found to possess analogous deposits of fat.

I was able to dissect a large number of adequate representatives of various species of *Bufo*. For this my grateful acknowledgments are mainly due to my father, Mr. G. A. Boulenger, F.R.S., who allowed me to examine numerous duplicates from the collections under his care at the British Museum. To Dr. F. Werner, of Vienna, I am indebted for a number of living specimens of the European Green Toad, *Bufo viridis*.

The very rare occurrence of adipose tissue in connection with the muscular system of Batrachia has often been commented on; thus Ant. Dugès (1) in his classical work on the myology and osteology of Batrachians, published in 1835, made the following generalization in his definition of the group: —"Une particularité dès longtemps remarquée c'est l'isolement réciproque des muscles et de la peau, dû à l'absence du pannicule graisseux dont on trouve à peine quelques paquets autour du cou chez les sujets à grand embonpoint."

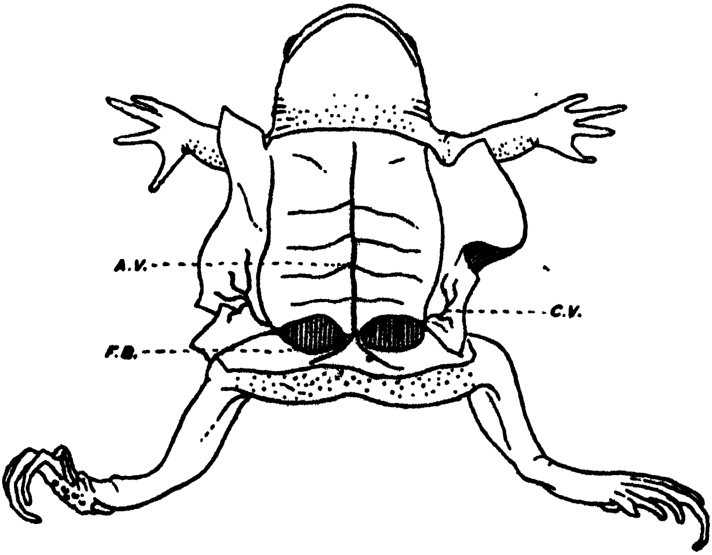
Corpora adiposa below the skin are, however, not quite unknown.

The most recent contribution to our knowledge of this subject is to be found in a paper by F. E. Beddard (7) on the anatomy of the Engystomatid *Hemisus*, the author describing a pair of conspicuous fat-bodies in lymph-sacs in the iliac region. These structures are lobulated masses of fat of considerable size, in appearance resembling the well-known abdominal fat-bodies at the anterior end of the gonads.

Similar fat-bodies are described as occurring in the neck-region and are probably connected with the thymus glands*.

The following brief remark by Leydig (2) shows that the presence of these bodies in *Bufo* had not escaped the attention of this accomplished investigator, who, however, abstains from any allusion to their structure: "Die Fettkorper in der Achselgrube und Weichengegend waren bei *calamita* rothgelb, bei *variabilis* graugelb, welche Farbenabänderung wohl nur in den verschiedenen Füllung der Blutgefässe gesucht werden darf."

Text-fig. 37.



Bufo viridis, ♀.

Ventral view, with the skin reflected to show the position of the subcutaneous fat-bodies.

F.B. Fat-body. *A.V.* Ventral abdominal vein. *C.V.* Cutaneous vein.

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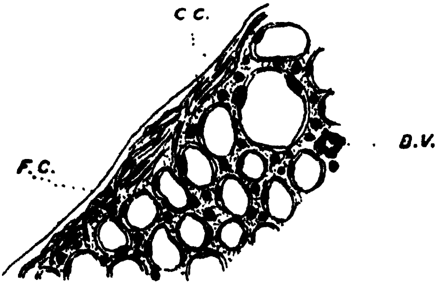
* These fat-bodies were noticed by Cope (3) so long ago as 1889, a fact which Mr. Beddard seems to have overlooked. In that author's description of *Hemisus* ('Batrachia of North America' p. 383) we find the following remarks:—
"This genus exhibits also an external corpus adiposum which I have not found in *Callula*, *Engystoma*, or any other genus of Batrachia. Each one is subtrihedral, the apex resting near the coracoid, the body lying between the strata of the external and internal oblique muscles . . . ."

II. *The Abdominal Fat-Bodies of* Bufo viridis.

The fat-bodies which I am about to describe are very well developed in the common European *Bufo viridis*, fresh material of which I had the opportunity of examining; it will, therefore, be well to preface my remarks with an account of their structure in this form. On reflecting the skin from the ventral surface of a specimen of *B. viridis*, one cannot fail to notice a pair of gland-like, fatty structures at the junction of the hind limbs with the trunk.

These corpora adiposa, which are present in both sexes and vary considerably both in size and colour in different individuals, are quite constant in position; each extends for a considerable distance along the face of the septum inguinale which separates the abdominal and femoral lymph-sacs.

Text-fig. 38.



Bufo viridis, ♀.

Transverse section of part of the subcutaneous fat-body, showing the fat-cells and the connective-tissue capsule. (Obj. ⅓.)

F.C. Fat-cell. *C.C.* Connective-tissue capsule. *B.V.* Blood-vessel.

When fully developed (as in the female specimen figured, text-fig. 37) the fat-bodies are of a bright orange-yellow colour and of considerable thickness. They may extend some distance along the side of the abdomen, their transverse diameter being thus the greatest, attaining a length of nearly 15 mm. In the opposite direction, the width is greatest near the middle line of the body, the body thinning out gradually on the side wall of the abdomen.

The outer free margin of the fat body is lobulated, the inner side being attached along its whole length to a conspicuous blood-vessel from which it obtains its blood-supply. This vessel is the vena cutanea femoralis, which runs into the pelvic vein just behind its junction with its fellow from the opposite side to form the ventral abdominal vein.

Sections of the fat-body (text-fig. 38, p. 381) show this organ to consist of an aggregation of fat-cells containing large fat-globules, with enough undifferentiated connective-tissue cells to hold the mass firmly together. Numerous sections of small blood-vessels are to be recognized, and a well-developed connective-tissue capsule surrounds the whole structure.

As mentioned above, the subcutaneous fat-bodies were found to occur in individuals of both sexes; it is, however, necessary to record the fact that these structures, at least in the specimens examined by me, are always better developed and more brilliantly coloured in the females, being somewhat inconspicuous and of a neutral grey colour in the males.

III. *The Fat-bodies in other Species of* Bufo.

Altogether, examples of twenty different species of *Bufo* were cut open and examined, and in fifteen of them fat-bodies were found, identical in structure and in position with those of *Bufo viridis*; in others, as for example the common *B. vulgaris*, no trace of these organs was present.

The complete list of species examined is given below, the forms possessing subcutaneous fat-bodies being marked + :—

+ *Bufo andersoni* Blgr.
„ *asper* Gravh.
+ „ *boreas* B. & G.
+ „ *calamita* Laur.
+ „ *carens* A. Smith.
+ „ *dodsonii* Blgr.
+ „ *granti* Blgr.
+ „ *halophilus* B. & G.
„ *latifrons* Blgr.
+ „ *lentiginosus* Shaw.

Bufo marinus L.
+ „ *mauritanicus* Schleg.
+ „ *melanostictus* Schneid.
+ „ *pentoni* Anders.
+ „ *raddii* Strauch.
+ „ *regularis* Reuss.
+ „ *spinulosus* Wiegm.
„ *tuberosus* Gthr.
+ „ *viridis* Laur.
„ *vulgaris* Laur.

In addition a number of other tailless Batrachians were examined, including European representatives of the families Hylidæ, Pelobatidæ, and Discoglossidæ: in none of these were fat-bodies to be found at the base of the thighs.

The above list shows that the species of *Bufo* possessing such fat-bodies are not by any means closely related forms; and that this point in Batrachian anatomy is therefore of no great systematic value. Thus *Bufo latifrons* and *Bufo regularis* are so closely related to one another that some authors refer them to the same species, yet they differ in that the former is devoid of subcutaneous fat-bodies, whereas in the latter these structures are constantly present.

IV. *The Function of the Subcutaneous Fat-Bodies.*

Conspicuous deposits of fat on the ventral abdominal wall are, as is well known, of frequent occurrence in Reptiles (4), and the fat-bodies of *Bufo* described above are similar in certain respects to those found in Lizards on the course of the pelvic and ventral abdominal veins. The latter veins in both Reptiles and in *Bufo* remove the blood from the corpora adiposa and convey it to the liver.

The function of these bodies is difficult to ascertain exactly: they are probably to be regarded as stores of food matter which are drawn upon when necessary. This view is supported by the fact that emaciated specimens have the fat-bodies much reduced, sometimes scarcely visible.

In order to further investigate this point a number of specimens of *Bufo viridis* were kept without food for a considerable time (15 weeks); all showed great reductions in the size of the fat-bodies as compared with those of well nourished specimens.

I mentioned above that the corpora adiposa of this toad were of greater size and contained more fatty matter in the females than in the males; examination of a number of specimens of *B. calamita*, the Natterjack, and of the closely related African form, *B. regularis*, showed this to be correct also of these species. It seems therefore probable that the fat-bodies have also some relation to the reproductive processes, as for example the production of large masses of yolk and albumen for the eggs.

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7. BEDDARD, F. E.—"Some notes on the muscular and visceral Anatomy of the Batrachian Genus *Hemisus*." Proc. Zool. Soc. 1908, p. 894.

March 1, 1910.

Dr. A. Smith Woodward, F.R.S., Vice-President, in the Chair.

The Secretary exhibited photographs of a Thylacine (*Thylacinus cynocephalus*) and three cubs which had been sent him by Mrs. Mary G. Roberts, C.M.Z.S., of Hobart, Tasmania. Mrs. Roberts had informed him by letter that the Thylacines had been in her possession for about eight months, and were tame and playful, and that the mother had nursed them until they were nearly as large as herself, although throughout that time they had also taken raw meat. Mrs. Roberts added that the Thylacine had extremely strong maternal instincts and that these animals, in her opinion, were not of low intelligence.

The Secretary called attention to the recently published 'Camera Adventures in the African Wilds,' by A. Radclyffe Dugmore, remarking on the great additions to knowledge of wild animals that were being obtained by this new form of sport. He directed special attention to the photographs of Grévy's Zebra, obtained near the Guaso Nyiro River, not far from Mt. Kenia, as evidence of the range of that species, and to an extremely interesting photograph of the Giant Bush-Pig (*Hylochœrus meinertzhageni*) taken in the same locality.

Mr. R. H. Burne, M.A., F.Z.S., exhibited a preparation[*] of the vena cava inferior, diaphragm, and liver of a Seal (*Phoca vitulina*) that had lately been living in the Society's Gardens. The specimen showed a strong sphincter band of muscle (*Sph. V. C.*) surrounding the lower end of the thoracic vena cava similar to that which was figured in the case of a Walrus in a note in the 'Proceedings' last year (p. 733). But this preparation showed in addition the continuity of some few of the muscle-fibres of the sphincter venæ cavæ with those of the diaphragm towards the left ventral side and the innervation of the sphincter by a branch of the phrenic nerve (*Ph. N.*). The vena cava was injected so that the enormous size of the venous reservoir (*V. S.*) formed by the dilatation of the vena cava and hepatic veins in the upper part of the liver could be clearly seen. Some reference was made to speculations on the physiological significance of these structures[†] in relation to the special needs of an aquatic life.

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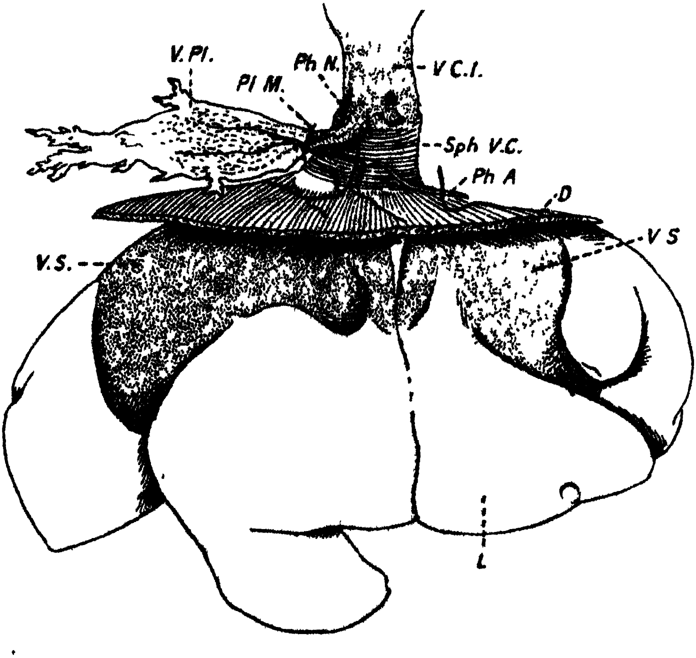
[*] R. College of Surgeons Museum, Physical Series, No. 980 E a a (prepared by the Prosector, Mr. W. Pearson).

[†] Gratiolet, 'Anatomie de l'Hippopotame,' p. 370. Burne, P. Z. S. 1909, p. 731. Paramore, 'Lancet,' 1910, May 28th.

Particular attention was drawn to a pair of venous plexuses * (*V.Pl.*) connected with the ventral surface of the vena cava just above the sphincter venæ cavæ. The plexus consisted of a coil of branching veins of considerable size and a relatively minute artery derived from the phrenic artery (*Ph.A.*). The blood-vessels with a small amount of fat lay enclosed within a sac of pleural membrane (*Pl.M.*), the whole structure projecting freely into the pleural cavity at the point of contact of the pleura and pericardium. The margins of the pleural sac were produced to form a fringe of arborescences, which were compared (following a suggestion of Professor Keith) with the fimbriæ of the synovial fringes in the

Text-fig. 39.



The thoracic and hepatic venæ cavæ inferior and liver of a Seal (*Phoca vitulina*).

D. Diaphragm; *L.* Liver; *Ph.A.* Phrenic artery; *Ph.N.* Phrenic nerve; *Pl.M.* Pleural membrane (cut edge); *Sph.V.C.* Sphincter venæ cavæ; *V.C.I.* Vena cava inferior (thoracic); *V.Pl.* Venous plexus; *V.S.* Venous sinus.

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* The plexus of the left side was accidentally removed.

joints or to the Pacchionian bodies in the venous sinuses of the dura mater.

It was suggested that these pleural venous plexuses were possibly of use in regulating the pressure of the pleural fluid in a manner similar to that in which the pressure of the cerebro-spinal fluid is regulated by the Pacchionian bodies.

Mr. Frank E. Beddard, M.A., F.R.S., F.Z.S., Prosector to the Society, exhibited a series of specimens of Earthworms from Luzon, Philippine Islands.

Dr. C. W. Andrews, F.R.S., F.Z.S., exhibited and made remarks upon some teeth of *Elephas* (*Stegodon*) *insignis* and of a species of horse from China. The former were from Sze-chuen, probably from beds of Lower Pliocene age, and were sent to the British Museum by the Rev. W. C. Taylor, of the China Island Mission. The horse teeth were from Tsi-shan, N. China, from a depth of about 300 feet in the Loess, probably of Pleistocene age; these were sent by the Rev. R. Gillies, also of the China Inland Mission.

Dr. R. T. Leiper, F.Z.S., exhibited the larval stage of *Trichostrongylus pergracilis*, the causal factor of Grouse disease. He found experimentally that the development follows almost exactly the same course as that of the Ankylostome—the cause of miner's disease in Cornwall. The egg developed into embryos in about two days, and metamorphosed on the eighth day into a peculiarly active larva that climbed heather only in wet weather. These larvæ were found in extraordinary numbers on the plants, the roots of which were experimentally infected. Subsequent drying did not kill the larvæ, for by encysting they could survive several weeks without additional moisture, but were unable, however, to resist desiccation. They underwent no further developmental change, and this stage, when fed to healthy Grouse, alone was able to produce infection, and within four days eggs were found in the droppings.

Dr. Leiper also exhibited a specimen of *Cyclops* containing a living embryo of *Cucullanus elegans*, a blood-sucking parasite of Perch, and discussed the mode of entry into *Cyclops* of this worm and the guinea-worm. Experiments showed that the embryos only penetrated living Cyclopidæ, and led to the conclusion that the *Cyclops* actually swallowed the living embryos and that these penetrated the stomach.

The following papers were read: –

1. Zoological Collections from Northern Rhodesia and adjacent Territories: *Lepidoptera Phalænæ*. By Sir GEORGE F. HAMPSON, Bart., F.Z.S.

[Received January 21, 1910.]

(Plates XXXVI.–XLI.*)

The collection of Moths made by Mr. S. A. Neave during his two journeys in Central Africa was, with the exception of a few species taken in Portuguese E. Africa on his journey homewards, entirely from the N. Western and N. Eastern districts of N. Rhodesia and the adjacent Katanga district of the Congo Free State. As the country is of moderate elevation without either high ranges of mountains or deep river valleys, the Moth fauna has a very uniform tropical African character with no mountain forms or forms of the faunas of the drier parts of either Southern or Northern Africa, and is mainly of a West African type together with a considerable number of forms found in East Africa and Mashonaland. The collection consists of 668 species, exclusive of a few *Pterophoridæ*, *Tortricidæ*, and *Tineidæ* which are not included, and of these 202 species are described as new; as follows:

Syntomidæ	21	species,	5	new.
Arctiadæ	21	„	8	„
Agaristidæ	29	„	7	„
Noctuidæ	253	„	86	„
Pterothysanidæ	5	„	1	„
Lymantriadæ	34	„	9	„
Hypsidæ	12	„	3	„
Sphingidæ	19	„	2	„
Eupterotidæ	7	„	2	„
Notodontidæ	6	„	2	„
Geometridæ	103	„	20	„
Saturniadæ	14	„		
Sabaliadæ	1	„		
Uraniadæ	4	„		
Arbelidæ	1	„		
Cossidæ	3	„	1	„
Lasiocampidæ	10	„	3	„
Chrysopolomidæ	3	„	2	„
Limacodidæ	11	„	6	„
Zygænidæ	14	„	8	„
Thyrididæ	1	„	1	„
Pyralidæ	87	„	28	„
Ægeriadæ	6	„	6	„
Hepialidæ	3	„	2	„

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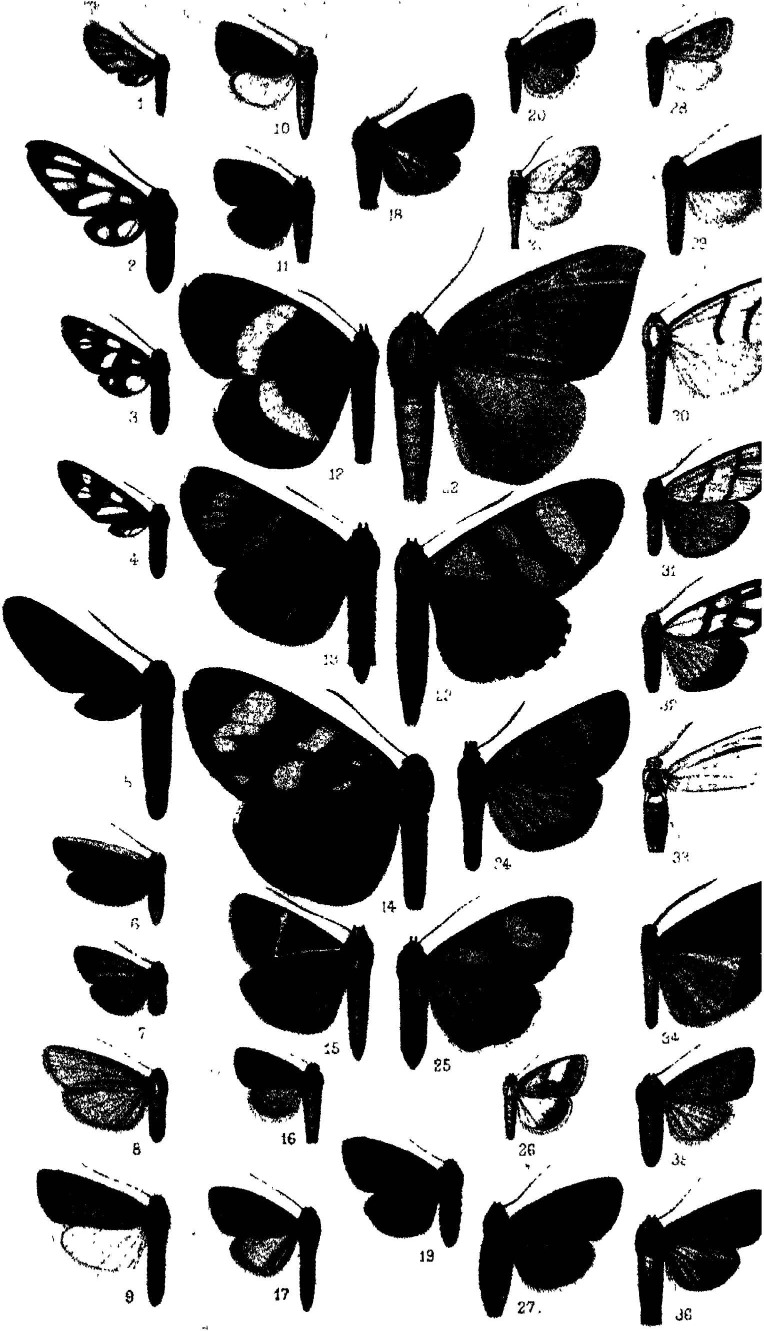
* For explanation of the Plates see p. 508.



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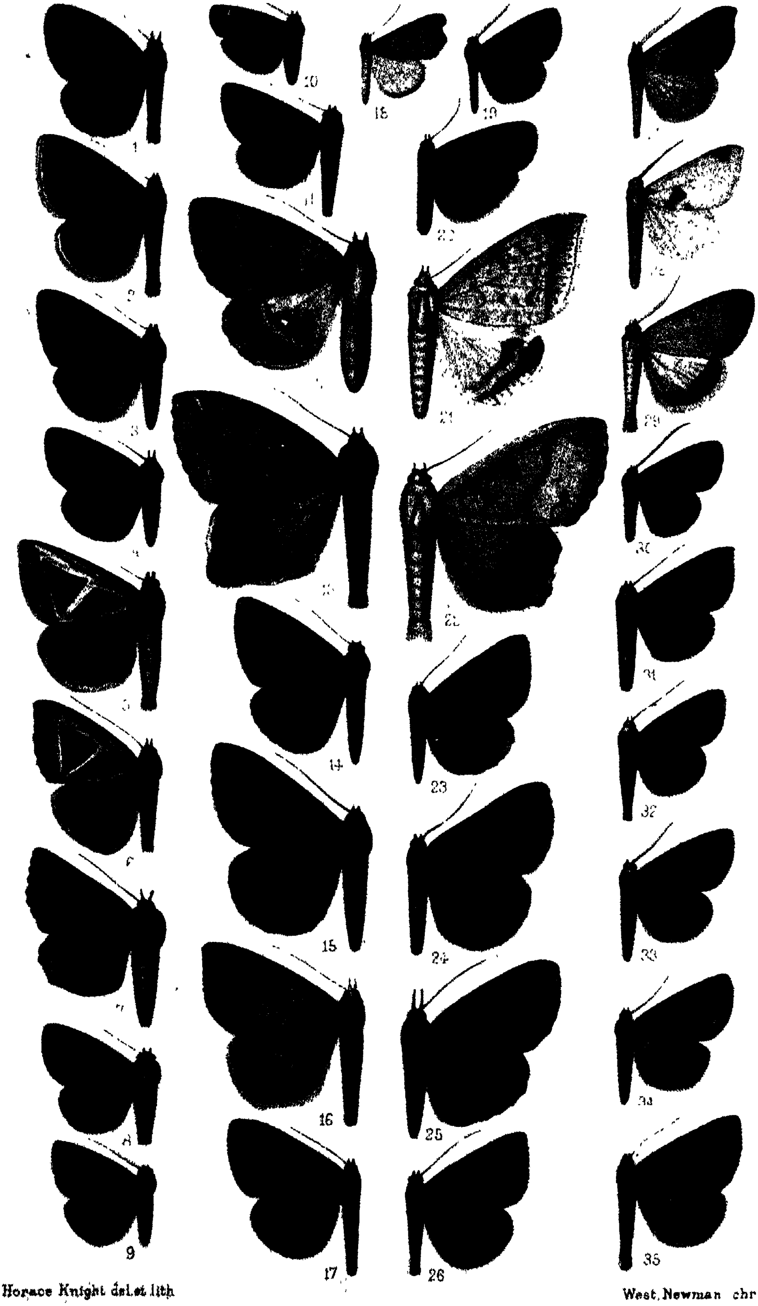
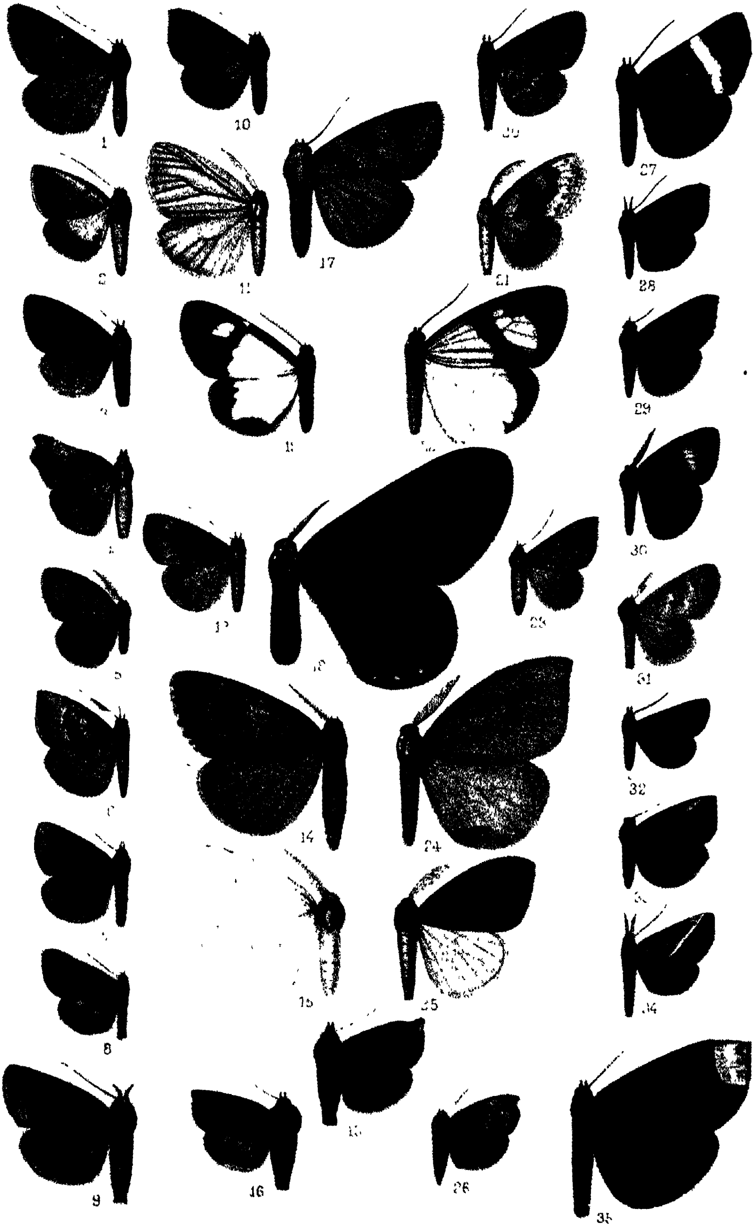


Horace Knight del.et lith

West, Newman chr

MOTHS FROM CENTRAL AFRICA

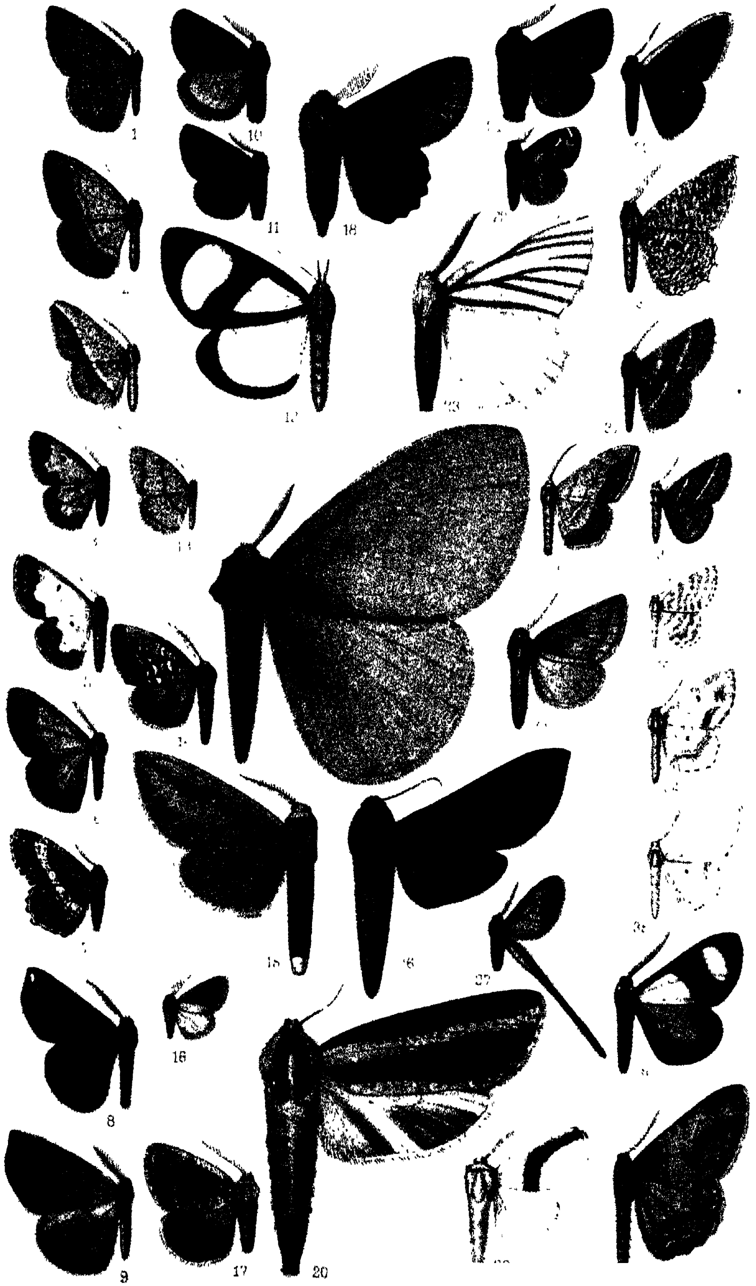
P. Z. S. 1910. Pl. XXXVIII.



Horace Knight del. et lith.

West, Newman chr.

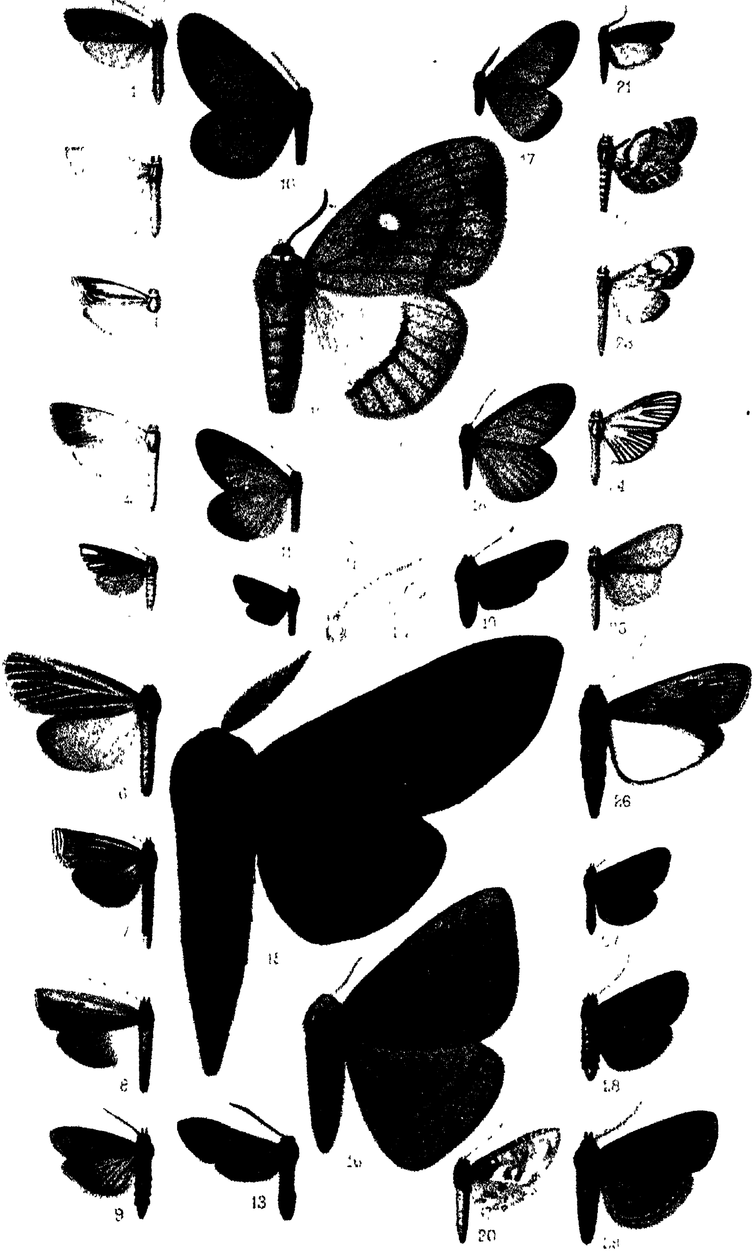
MOTHS FROM CENTRAL AFRICA.



Horace Knight del et lith.

West Newman imp.

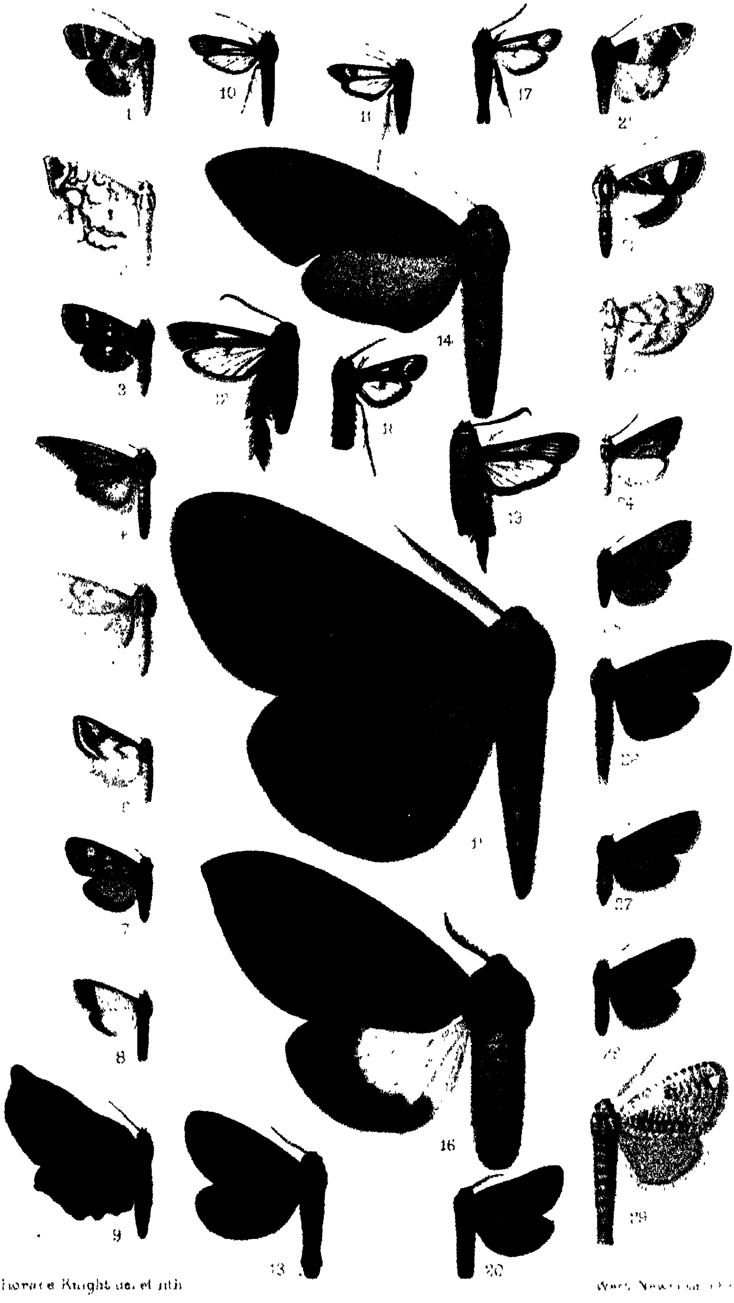
[illegible] MOTHS FROM CENTRAL AFRICA.



Knight del. et lith.

West, Newman imp.

MOTHS FROM CENTRAL AFRICA



Horace Knight del. et lith.

West, Newman imp.

MOTHS FROM CENTRAL AFRICA.

SYNTOMIDÆ.

CERYX ALBIMACULA Wlk. i. 128 (1854).

CONGO, Katanga, Kambove.

TRICHÆTA PTEROPHORINA Mab. Bull. Soc. Ent. Fr. 1892, p. 139.

CONGO, Lualaba R.; N.E. RHODESIA, Luangwa R., Chambezi R.

TRICHÆTA FULVESCENS Wlk. i. 132 (1854).

N.E. RHODESIA, Luangwa distr., Chinsala distr., Bangweolo distr., Chambezi R., Kalungwisi distr.

SYNTOMIS HEMIPHŒNICA, sp. n. (Pl. XXXVI. fig. 1.)

♂. Head and thorax black with a faint metallic gloss; antennæ white at tips; frons white; tarsi whitish at base; abdomen crimson, the last three segments and the ventral surface black with a faint metallic gloss. Fore wing black with a faint metallic gloss; a wedge-shaped hyaline patch in cell, an oblique patch below vein 2 and elongate patches above veins 7, 6, 4, 3. Hind wing black with a faint metallic gloss; a large hyaline patch below the cell from before middle to near tornus and a round patch beyond the cell above vein 2.

♀. Abdomen with dorsal maculate black fascia on segments 3 to 5.

Hab. CONGO, Kambove distr. (*Neave*), 1 ♂, 2 ♀ type. *Exp.* 24 mm.

SYNTOMIS MIOZONA, sp. n. (Pl. XXXVI. fig. 2.)

♀. Head, thorax, and abdomen deep metallic green; frons pure white; antennæ white at tips; pectus with lateral crimson patches; basal joint of tarsi white; abdomen with dorsal crimson patch at base. Fore wing deep metallic green; a hyaline patch below base of cell, wedge-shaped patch in end of cell, oblique patch below vein 2 and elongate patches above vein 6 and below veins 4 and 3; cilia white below apex. Hind wing deep metallic green with hyaline patches below the cell and beyond the cell between veins 4 and 2.

Hab. N.E. RHODESIA, Fort Jameson (*Neave*), 1 ♀ type. *Exp.* 40 mm.

Subsp. i. Wings more purplish black except costal area of fore wing; cilia not white below apex.

Hab. GERM. E. AFRICA, Magila, 3 ♀. *Exp.* 30 mm.

Differs from *S. ceres* in the frons being white.

SYNTOMIS CROCEIZONA, sp. n. (Pl. XXXVI. fig. 3.)

♀. Head, thorax, and abdomen black shot with metallic green; tarsi with the basal joint white; abdomen with orange-red dorsal patch at base. Fore wing black shot with purple, the costal area with a metallic green tinge; a small hyaline spot below the cell near base, a quadrate patch in end of cell, an oblique patch below vein 2 and elongate spots above vein 6 and below veins 4 and 3; cilia white towards apex. Hind wing black shot with purple, a hyaline patch below the cell and small spot between veins 4, 3.

Ab. 1. Wings shot with metallic green instead of purple.

Hab. N.W. RHODESIA, Alala plateau (*Neave*), 4 ♀; N.E. RHODESIA, Bangweolo distr. (*Neave*), 1 ♀, Kalungwisi valley (*Neave*), 2 ♀ type. *Exp.* 30 mm.

Differs from *S. ceres* in being without the scarlet patches on pectus

SYNTOMIS CERBERA Linn. Mus. Ulr. p. 363 (1764).

CONGO, Katanga, Kambove; N.E. RHODESIA, Luangwa distr., Bangweolo distr., Chambezi R., Tanganyika plateau, Lofu valley.

SYNTOMIS TOMASINA Butl. Journ. Linn. Soc., Zool. xii. p. 348 (1876).

CONGO, Katanga, Kambove.

SYNTOMIS ENDOCROSSIS Hmpsn. A. M. N. H. (7) xi. p. 338 (1903).

CONGO, Katanga, Kambove.

SYNTOMIS MARINA Butl. Journ. Linn. Soc., Zool. xii. p. 348 (1876).

N.E. RHODESIA, Kalungwisi distr.

ERESSA PLEUROSTICTA, sp. n. (Pl. XXXVI. fig. 4.)

♀. Head, thorax, and abdomen dark brown; antennæ white at tips; shoulders with yellow patches; fore legs with the extremities of tibiæ and the tarsi yellowish; abdomen with dorsal yellow band at base and ill-defined yellow lateral and sublateral spots on medial segments. Fore wing black-brown with quadrate hyaline patch in middle of cell, elongate oblique patch below vein 2, small patch above its base and postmedial patches above veins 6, 5, 4, 3. Hind wing black-brown with hyaline subterminal spots above and below vein 2 and smaller spot above vein 3.

Hab. CONGO, Lualaba R. (*Neave*), 1 ♀ type. *Exp.* 30 mm.

PSEUDONACLIA PUELLA Boisd. Voy. Delegorgue, ii. p. 569 (1847).

N.E. RHODESIA, Chambezi R.

THYRETES MONTEIROI Butl. Journ. Linn. Soc., Zool. xii. p. 359 (1876).

CONGO, Katanga, Kambove.

METARCTIA LATERITIA Herr.-Schäff. Aussereur. Schmett. f. 274 (1855).

N.E. RHODESIA, Luangwa distr., Fort Jameson.

METARCTIA BURRA Schaus, Lep. S. Leone, p. 23, pl. i. f. 6 (1893).

CONGO, Katanga, Kambove.

METARCTIA FLAVIVENA Hmpsn. Ann. S. Afr. Mus. i. p. 40 (1900).

PORTUGUESE E. AFRICA, Makanga distr.

PSEUDAPICONOMA NIGRIPENNIS Auriv. Ark. f. Zool. ii. 4, p. 30 (1904).

CONGO, Katanga, Kambove.

PSEUDAPICONOMA FENESTRATA Jord. Nov. Zool. xi. p. 442 (1904).

CONGO, Katanga, Kambove.

Genus PSEUDMELISA, nov.

Type, *P. chalybsa.*

Proboscis absent; palpi small, porrect; antennæ of female laminate; tibiæ with minute terminal pairs of spurs; abdomen very elongate. Fore wing narrow and elongate, the termen very obliquely curved; vein 3 from before angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8, 9, 10 stalked, 10 from beyond 7; 11 from cell. Hind wing small; vein 3 from before angle of cell, 4, 5 from angle; 6, 7 coincident.

PSEUDMELISA CHALYBSA, sp. n. (Pl. XXXVI. fig. 5.)

♀. Head and thorax black slightly irrorated with metallic blue; shoulders and pectus at sides with crimson spots; abdomen black with a slight metallic blue gloss; a crimson dorsal band at base and lateral patches on the next four segments, a slight yellow dorsal spot on 6th segment, the two terminal segments dorsally yellow, the anal tuft crimson. Fore wing brilliant metallic blue. Hind wing black shot with metallic blue.

Hab. CONGO, Kambove distr. (*Neave*), 1 ♀ type. *Exp.* 46 mm.

EUCHROMIA LETHE Fabr. Syst. Ent. p. 553 (1775).

CONGO, Katanga, Kambove.

EUCHROMIA SPERCHIA Cram. Pap. Exot. ii. pl. 146, f. C (1777).

CONGO, Katanga, Kambove.

ARCTIADÆ.

LITHOSIANÆ.

ILEMA ELEGANS Butl. Trans. Ent. Soc. 1877, p. 347.

Subsp. *restricta*, nov.

Abdomen dorsally orange; male with the terminal band of fore wing much narrower, of hind wing hardly more than a line;

female with the band of fore wing narrowing to a point at tornus; hind wing without band.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 2 ♂, 1 ♀ type. *Exp.* ♂ 32, ♀ 38 mm.

ILEMA HETEROGYNA, sp. n. (Pl. XXXVI. fig. 6.)

♂. Head and tegulæ orange-yellow; thorax fuscous brown with a greyish tinge; pectus and legs yellow, the fore and mid tibiæ and tarsi, the hind tibiæ at extremity and tarsi towards extremity black above; abdomen orange-yellow, dorsally blackish on basal half. Fore wing fuscous grey, the costal area yellow narrowing to a point at apex. Hind wing fuscous brown with some orange suffusion on disk and inner area; cilia yellow; the underside orange yellow, the termen suffused with fuscous except at apex and towards tornus, some fuscous irroration in cell and below costa.

♀. Fore wing paler, the cilia yellow; hind wing yellow.

Hab. N.E. RHODESIA, Serenji distr. (*Neave*), 1 ♂, 1 ♀ type. *Exp.* ♂ 39, ♀ 32 mm.

Genus PSEUDLEPISTA, nov.

Type, *P. atrizona*.

Proboscis fully developed; palpi porrect, short, not reaching as far as the large rounded frontal prominence; antennæ of male bipectinate, with very short branches, of female typically very minutely serrate; fore tibiæ very short, with short outwardly curved claw on outer side at extremity. Fore wing with vein 2 from towards angle of cell, straight; 3, 4 stalked; 5 absent; 6 from upper angle; 7, 8, 9 stalked, 7 from before 9; 10, 11 typically stalked or from a point, 11 bent upwards and touching 12. Hind wing with vein 2 from towards angle of cell; 3, 4 strongly stalked; 5 absent; 6, 7 stalked; 8 from middle of cell.

PSEUDLEPISTA ATRIZONA, sp. n. (Pl. XXXVI. fig. 7.)

Head orange, the palpi, sides of frons, and antennæ black; thorax black, the tegulæ with some orange on edges, the patagia orange with black upper edge; coxæ and fore femora at extremities with some orange; abdomen orange, dorsally black at base. Fore wing orange with broad black terminal band expanding into a large rounded patch on apical area. Hind wing orange with black terminal band, broad at costa, narrowing to a point at tornus.

Hab. N.E. RHODESIA, Serenji distr. (*Neave*), 1 ♂, 1 ♀ type. *Exp.* 22 mm.

PSEUDLEPISTA FLAVICOSTA, sp. n. (Pl. XXXVI. fig. 8.)

Antennæ of female ciliated; fore wing with vein 11 well separated from 10 and anastomosing with 12.

♀. Head and thorax orange, the metathorax with a whitish patch; palpi with the 3rd joint black; fore legs, mid tibiæ and tarsi and hind tibiæ at extremity, and the tarsi brown above; abdomen pale yellow. Fore wing very pale yellow, the inner area more ochreous, the costal edge orange. Hind wing very pale yellow. Underside of fore wing and costal area of hind wing more orange, the disk of fore wing tinged with fuscous.

Hab. Congo, Katanga distr. (*Neave*), 1 ♀ type. *Exp.* 34 mm.

Caripodia chrysargyria Hmpsn. Cat. Lep. Phal. B. M. ii. p. 248 (1900).

Congo, S.E. Katanga; N.E. Rhodesia, E. Luangwa distr.

Anaphosia cyanagramma Hmpsn. A. M. N. H. (7) xi. p. 344 (1903).

Congo, S.E. Katanga.

Anaphosia astrigata, sp. n. (Pl. XXXVI. fig. 30.)

Head orange; antennæ black; thorax yellowish white, the tegulæ edged with orange; pectus and legs orange, the fore femora blackish above, mid tibiæ streaked with black, the tarsi blackish; abdomen orange. Fore wing silvery yellowish white; the costa black; an oblique black medial line slightly bent outwards to inner margin; postmedial line black, oblique to vein 2, then erect, joined at vein 5 by a curved black line from costa before apex; cilia orange. Hind wing orange-yellow. Underside of fore wing suffused with brown except terminal half of costal area and terminal area.

Hab. Congo, Katanga distr. (*Neave*), 2 ♂, 2 ♀; Mashonaland, Salisbury (*Marshall*), 1 ♀ type. *Exp.* 34–44 mm.

Anaphosia pectinata, sp. n. (Pl. XXXVI. fig. 31.)

Antennæ of male bipectinate, with short branches ending in a bristle, of female serrate.

Head, thorax, and abdomen orange; sides of frons with black patches; antennæ black; fore and mid tibiæ above and the tarsi black. Fore wing yellow; the costa and inner margin except at base narrowly black; a black medial line, excurved from costa to middle of cell, then oblique and slightly sinuous; a black postmedial line, slightly excurved below costa, then oblique and slightly excurved in submedian interspace, a black streak from it in discal fold bent upwards to costa before apex, its angle connected or nearly connected with termen and with an oblique black streak from postmedial line to termen below vein 4, a terminal black line; cilia black at base, yellowish at tips. Hind wing orange with narrow black terminal band, its inner edge somewhat diffused inwards between veins 6 and 3.

Hab. Congo, Kambove distr. (*Neave*), 2 ♂, 1 ♀ type. *Exp.* 36–38 mm.

Anaphosia eurygrapha, sp. n. (Pl. XXXVI. fig. 32.)

♂. Head, tegulæ, and patagia pale yellow; frons with black bands; antennæ brown; neck black; dorsum of thorax dark brown; fore femora at extremities, fore and mid tibiæ, hind tibiæ at extremities, and the tarsi dark brown; abdomen dorsally dark brown, ventrally orange. Fore wing yellowish white; the costa and inner margin except at base black; a narrow medial black band, oblique below median nervure and connected by a streak on median nervure with the narrow black postmedial band which is slightly excurved below costa, then oblique and slightly excurved in submedian interspace, with a black fascia from it in discal fold bent upwards to costa before apex, its angle expanding into a patch to near termen, an oblique black fascia from postmedial line to termen below vein 4; termen and cilia black. Hind wing orange; a broad terminal black band narrowing to tornus and with a blackish line just before its inner edge between vein 6 and submedian fold; the underside with narrow black terminal line.

Hab. N.E. Rhodesia, Serenji distr. (*Neave*), 1 ♂ type. *Exp.* 36 mm.

Philenora unicolor Hopff. Monatsber. Akad. Berl. 1857, p. 422.

N.E. Rhodesia, upper Luangwa valley.

Arctianæ.

Diacrisia punctulata Wllgrn. Wien. Ent. Mon. iv. p. 161 (1860).

N.E. Rhodesia, upper Luangwa valley, E. Luangwa distr.

Diacrisia maculosa Stoll, Pap. Exot. iv. pl. 370. f. B (1781).

N.W. Rhodesia, Alala plateau.

Diacrisia diplosticha Hmpsn. Ann. S. Afr. Mus. ii. p. 57 (1900).

N.E. Rhodesia, E. Luangwa distr.

Diacrisia lutescens Wlk. iii. 672 (1855).

Congo, Katanga, Kambove.

Acantharctia tenuifasciata, sp. n. (Pl. XXXVI. fig. 33.)

♂. Frons yellow, the vertex of head and thorax white; palpi black above; antennæ black, the shaft white above on basal half; legs yellow, the tibiæ and tarsi brown above; abdomen white at base, then yellow with dorsal brown bands. Fore wing white; the costal edge yellow; the interspaces with faint brownish fasciæ, the fascia in discal fold from middle of cell to termen and the fascia above vein 6 more distinct. Hind wing pure white.

Hab. Congo, Katanga distr. (*Neave*), 2 ♂ type. *Exp.* 38 mm.

Teracotona euprepia Hmpsn. Ann. S. Afr. Mus. ii. p. 58 (1900).

Congo, Katanga, Kambove; N.W. Rhodesia, Alala plateau.

Teracotona rhodophæa, Wlk. xxxi. 302 (1864).

N.W. Rhodesia, Petauke distr.

Utetheisa callima Swinh. A. M. N. H. (7) xix. p. 202 (1907).

Congo, Katanga, Kambove.

Utetheisa pulchella Linn. Syst. Nat. i. p. 534 (1758).

Portuguese E. Africa, Nyanji; N.E. Rhodesia, E. Luangwa distr., Feira, upper Luangwa valley.

Secusio strigata, Wlk. ii. 559 (1854).

N.E. Rhodesia, E. Luangwa distr., N. Luangwa, Mt. Ulungu.

Secusio atrizonata, sp. n. (Pl. XXXVI. fig. 34.)

♂. Head and thorax orange with black streaks on vertex and sides of head and vertex of thorax and patagia and spots on frons and tegulæ; palpi black except at base; the antennæ black with the shaft white above except towards tips; legs striped fuscous and whitish; abdomen orange with lateral and sublateral series of black points, the ventral surface whitish. Fore wing brown suffused with grey, the veins and discal and submedian folds on basal half streaked with whitish; a small whitish spot in end of cell; cilia greyish at tips. Hind wing orange with black terminal band, rather broad from apex to vein 2, then narrow to vein 1 where it terminates; cilia orange, whitish at tips, tinged with fuscous at base towards tornus. Underside of fore wing orange, the terminal area black from costa beyond middle to inner margin near tornus, its inner edge slightly irregular.

Hab. N.E. Rhodesia, Tanganyika plateau, Lofu valley (*Neave*), 1 ♂ type. *Exp.* 44 mm.

AGARISTIDÆ.

Xanthospilopteryx poggei Dewitz, Mitth. Ent. Ver. iii. p. 31, pl. 2. f. 3 (1879).

Congo, Katanga, Kambove.

Xanthospilopteryx perdix Druce, P. Z. S. 1887, p. 668.

N.E. Rhodesia, E. Luangwa distr.

Xanthospilopteryx indecisa Butl. A. M. N. H. (6) vii. p. 50 (1891).

N.E. Rhodesia, E. Luangwa distr.

Xanthospilopteryx africana Butl. A. M. N. H. (4) xv. p. 142 (1875).

N.E. Rhodesia, upper Luangwa valley, E. Luangwa distr.

[*Xanthospilopteryx africana* Butl. and allied species are common everywhere during the wet season from October to April. They are diurnal in their habits and have a rather powerful flight. They are very conspicuous on the wing and almost certainly form the models for butterflies such as *Euphædra crawshayi* Butl. and allied species.—S. A. N.]

Xanthospilopteryx superba Butl. A. M. N. H. (4) xv. p. 141, pl. 13. f. 3 (1875).

Congo, Katanga, Kambove. The form with yellow hind wing.

N.E. Rhodesia, E. Luangwa distr., Luangwa valley, upper Luangwa valley, Mpika, Bangweolo distr.; Portuguese E. Africa, Makanga distr. The form with crimson hind wing.

Xanthospilopteryx atriventralis, sp. n. (Pl. XXXVI. fig. 13).

♂. Head and thorax black; 1st and 2nd joints of palpi, sides of frons, vertex of head and tegulæ at middle and sides with paired white points; patagia with yellowish spots; tibiæ with yellowish bands, the femoro-tibial joints and tarsi with white points; abdomen black with dorsal and lateral yellow bands, the ventral surface black. Fore wing black with oblique silvery blue bar in middle of cell with slight streaks above and below it, a discoidal lunule and short streak on middle of vein 2; a subbasal yellow spot below costa, elongate antemedial spot below costa and small spot above vein 5, a spot in middle of cell and medial spot above vein 1; an oblique yellow band from below middle of costa to vein 1 towards tornus, dilated at vein 2 and ending in a point; an oblique subapical band from below costa to vein 3 near termen, its extremities rounded, and a small subterminal spot above vein 1; cilia white at apex. Hind wing scarlet with black terminal band expanding somewhat towards apex and at vein 2; cilia whitish at apex; the underside with the costa narrowly black to near base.

Hab. N.E. Rhodesia, Serenji distr. (*Neave*), 1 ♂ type. *Exp.* 56 mm.

Xanthospilopteryx discosticta, sp. n. (Pl. XXXVI. fig. 23.)

♂. Head and thorax black; 1st and 2nd joints of palpi, sides of frons, and back of head with white points; gulæ white; tegulæ, shoulders, and patagia with yellowish white points, the last with some yellowish at tips; tibiæ with yellow bands, the base and extremities of tibiæ and the tarsi with white points; abdomen orange-yellow tinged with fuscous, the extremity and ventral surface black, sublateral and ventral series of small yellow spots, Fore wing black; whitish points at base below costa and cell; a large triangular antemedial yellow patch extending from below costa to vein 1; an oblique band from below middle of costa to above tornus, constricted just below the cell and rather pointed at lower extremity; a broad band from below costa beyond middle to near termen below vein 3, where its extremity is pointed and somewhat recurved; three obliquely placed small yellow spots across apical area and a subterminal spot in submedian fold; oblique silvery blue lines in and below middle of cell and on discocellulars; cilia with a series of white spots. Hind wing scarlet with black discoidal striga and terminal band slightly angled inwards at vein 2; the cilia with series of white spots. Underside of fore wing with the yellow markings tinged with scarlet; hind wing with small subapical patch of yellow scales.

Hab. N.W. Rhodesia, Alala plateau (*Neave*), 1 ♂ type. *Exp.* 64 mm.

Xanthospilopteryx neavi, sp. n. (Pl. XXXVI. fig. 14.)

♀. Head and thorax black; 1st and 2nd joints of palpi, frons, and back of head with white points; gulæ white; tegulæ, shoulders, and patagia with white points; tibiæ banded with orange, the tibiæ at base and extremity and the tarsi ringed with white; abdomen orange-yellow tinged with fuscous the extremity blackish above, a lateral series of black points. Fore wing black; some small whitish spots below base of costa and two subbasal spots below the cell: a triangular yellow antemedial spot in cell, slight mark below the cell, and wedge shaped mark above vein 1; a broad oblique bar across end of cell, expanding at lower extremity, and oblique patch below end of cell; an oblique band from below costa beyond middle to near termen at vein 3, somewhat constricted at vein 5 and its inner edge excised at vein 4; a subterminal spot above tornus; a silvery blue striga in middle of cell and some scales below the cell and on discocellulars; cilia white at apex. Hind wing crimson with black terminal band somewhat angled inwards at vein 2; the cilia white at apex; the underside with the black extending on costa to middle.

Hab. N.E. Rhodesia, Chinsali distr. (*Neave*), 1 ♂ type. *Exp.* 72 mm.

Xanthospilopteryx æmulatrix Westw. Oates' 'Matabeleland,' p. 355 (1881).

Congo, Katanga, Kambove.

Xanthospilopteryx flavipennis Bartel. Verh. Ges. Wien, liii. p. 121 (1903).

Congo, Katanga, Kambove.

Xanthospilopteryx hornimanni Druce, Ent. Mo. Mag. xvi. p. 269 (1880).

Congo, Katanga, Kambove.

POLACANTHOPODA TIGRINA Druce, P. Z. S. 1882, p. 778, pl. 60. f. 4.

CONGO, Katanga, Kambove.

ANDRHIPPURIS CAUDEQUINA Karsch, Ent. Nachr. xxi. p. 358, pl. 1. ff. 1, 2 (1895).

CONGO, Katanga, Kambove.

[*Andrhippuris caudequina* Karsch. This species, in common with many other diurnal moths, appeared in considerable numbers at the beginning of the rainy season in October. I met with it only in Katanga, never in Northern Rhodesia.—S. A. N.]

CHARILINA AMABILIS Drury, Ill. Ex. Ent. ii. pl. 13. f. 3 (1773).

N.E. RHODESIA, E. Luangwa distr., upper Luangwa valley, Chinsali distr., Fort Jameson.

PSEUDOSPIRIS PAIDIFORMIS Butl. P. Z. S. 1895, p. 267, pl. xv. ff. 8, 9.

N.E. RHODESIA, Chambezi valley, Chinsali distr.

PAIS NYASSANA Bartel. Verh. Ges. Wien, liii. p. 128 (1903).

CONGO, Katanga, Kambove.

ÆGOCERA AFFINIS Druce, Ent. Mo. Mag. xx. p. 155 (1883).

N.E. RHODESIA, E. Luangwa distr.

ÆGOCERA GEOMETRICA, sp. n. (Pl. XXXVI. fig. 15.)

♀. Head white, black at sides; palpi chocolate-red fringed with yellow and brown hair, the extremity of 2nd joint white, the 3rd joint white at base, black at tip; antennæ black with some white above; thorax chocolate-red with white patches on shoulders and metathorax; pectus and legs orange, the fore and mid femora with some black above and the tibiæ with black spots, the terminal joints of tarsi black above; abdomen orange with dorsal black patch at base. Fore wing chocolate-red; the costa black irrorated with white, the costal edge white except towards base; an oblique white streak from below base of costa to vein 1 beyond middle, where it is met by a narrow white band from costa; cilia white. Hind wing orange with broad black terminal band; cilia yellow at tips. Underside of fore wing yellow with the terminal area black-brown, a round black spot in end of cell almost confluent with a black bar beyond the cell angled inwards below its extremity.

Hab. CONGO, Kambove distr. (*Neave*), 1 ♀ type. *Exp.* 42 mm.

ÆGOCERA MENETE Cram. Pap. Exot. i. pl. 70. f. D (1775).

CONGO, Katanga, Kambove.

ÆGOCERA TRICOLORA B. Baker, A. M. N. H. (8) iii. p. 434 (1909).

CONGO, Katanga, Kambove; N.E. RHODESIA, Kapopo.

ÆGOCERA DISPAR Roths. Nov. Zool. iii. p. 43. pl. 15. ff. 27, 28 (1896).

CONGO, Katanga, Kambove.

LOPHONOTIDIA NOCTURNA Hmpsn. Cat. Lep. Phal. B. M. iii p. 617 (1901).

N.E. RHODESIA, E. Luangwa distr.

Genus HOPLARISTA, nov.

Type, *H. hæmaplaga*.

Proboscis fully developed; palpi with the 2nd joint obliquely upturned and moderately fringed with hair, the 3rd porrect, rather long and somewhat dilated at extremity; frons with long flattened corneous process at middle, bifid at extremity, and corneous plate below it excised in front; eyes large, round; antennæ slightly dilated towards extremity; thorax clothed with hair and scales mixed, the metathorax with spreading crest; tibiæ moderately fringed with hair; abdomen with hairy crest at base only. Fore wing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hing wing with veins 3,4 from angle of cell; 5 obsolescent from middle of discocellulars; 6,7 from upper angle; 8 anastomosing with the cell near base only.

HOPLARISTA HÆMAPLAGA, sp. n. (Pl. XXXVI. fig. 24.)

♂. Head and thorax dark chocolate-brown mixed with pale yellow and some orange; frons with lateral yellowish white spots above; pectus orange; legs banded black and orange; abdomen banded black and orange, the ventral surface dark brown with series of yellow bars. Fore wing dark chocolate-brown irrorated with silvery blue and some yellow scales; a triangular yellow antemedial patch in cell with elongate blood-red patch below it, connected with the oblique yellow medial band extending from below costa to submedian fold, edged by blood-red at sides, its inner edge slightly angled inwards at median nervure and submedian fold and its outer edge strongly dilated below; a postmedial yellow patch from below costa to vein 2, rounded above and its lower extremity pointed and bent inwards. Hind wing deep orange; a slight black discoidal lunule; a black-brown terminal band, its inner edge slightly incurved at discal fold and strongly at vein 2; a small yellow spot on termen at submedian fold. Underside of fore wing yellow, the costa black-brown except towards base, a black-brown and red spot in middle of cell with red spot below it in submedian interspace, a large lunulate discoidal patch connected with the dark costa and with some dark suffusion below it, a broad dark terminal band expanding towards apex and interrupted by yellow below vein 2; hind wing with the costa black-brown to near base.

♀. Fore wing with the antemedial patch in cell red with slight yellow spot on it, widely separated from the medial band which is narrower and less dilated below, the postmedial patch not extending below vein 4 where it is somewhat pointed on outer side; hind wing with the terminal band broader and without yellow spot at submedian fold.

Hab. N.E. RHODESIA, Lake Bangweolo (*Neave*), 1 ♂, 1 ♀ type. *Exp.* ♂ 50, ♀ 52 mm.

TUERTA OVIFERA, sp. n. (Pl. XXXVI. fig. 25.)

♀. Head and thorax black-brown; palpi with the 2nd joint white in front towards base, the 3rd joint white at base; sides of frons and streaks on tegulæ and patagia yellowish white; pectus and base of legs yellow, the tibiæ banded with yellow; abdomen orange-yellow with dorsal black-brown stripe, the ventral surface black-brown with white bands. Fore wing deep chocolate-brown, the terminal area irrorated with grey-white scales; a pale yellow wedge shaped patch in and below cell from base to origin of vein 2, its upper edge excised towards extremity; a minute triangular yellow spot in upper end of cell; an oblique elliptical pale yellow postmedial patch from below costa to below vein 3; some silvery scales below costa near base; oblique greyish bars with silvery scales on them in middle of cell and on discocellulars; postmedial line double, the inner line grey, the outer silvery, obliquely excurved round the yellow patch from costa to vein 2, then angled inwards to below end of cell and again excurved: cilia greyish, silvery at tips. Hind wing deep orange with broad black-brown terminal band; cilia brownish at base, white at tips. Underside of fore wing with the basal half orange with small black spot in end of cell.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 2 ♀ type. *Exp.* 48-54 mm.

OMPHALOCEPS DARIA Druce, A. M. N. H. (6) xv. p. 42 (1895).

N.E. RHODESIA, E. Luangwa distr.

HESPAGARISTA CAUDATA Dewitz, Mitth. Münch. Ent. Ver. iii. p. 30, pl. i. ff. 3, 3*a* (1879).

CONGO, Katanga, Kambove; N.W. RHODESIA, Alala plateau.

[*Hespagarista caudata*, Dewitz. This seems a very local species which appears to prefer open grassy situations near water. —S. A. N.]

HESPAGARISTA KENDALLI Roths. Nov. Zool. iii. p. 97 (1896).

CONGO, Katanga, Kambove; N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Mpika, Mansya R., Bangweolo distr.

MASSAGIDIA HESPARIA Cram. Pap. Exot. i. pl. 56. f. C (1775).

CONGO, Katanga, Kambove.

MASSAGIDIA TENUIFASCIA, sp. n. (Pl. XXXVI. fig. 12.)

♀. Head and tegulæ crimson, the 3rd joint of palpi and antennæ black; thorax and abdomen black slightly shot with blue, the terminal segments of abdomen crimson; pectus in front and fore femora crimson. Fore wing black shot with blue, the veins and submedian fold streaked with brilliant blue, a rather broad medial white band, oblique from costa to lower angle of cell, then erect: cilia white at apex. Hind wing black shot with blue; a medial white band narrowing to inner margin and with its outer edge curved; cilia white at apex.

One specimen has veins 6, 7, 8, 9, 10 of fore wing stalked.

Hab. CONGO, Kambove distr. (*Neave*), 3 ♀ type. *Exp.* 48 54 mm.

NOCTUIDÆ.

AGROTINÆ.

CHLORIDEA OBSOLETA Fabr. Ent. Syst. iii. 1. p. 456 (1793).

CONGO, Katanga, Kambove: N.W. RHODESIA, Alala plateau; PORTUGUESE E. AFRICA, Chinde.

CHLORIDEA FLAVIGERA Hmpsn. A. M. N. H. (7) xix. p. 248 (1907).

N.E. RHODESIA, Luangwa valley.

TIMORA ALBIPUNCTA, sp. n. (Pl. XXXVI. fig. 28.)

Antennæ of male serrate.

Head, thorax, and abdomen ochreous yellow. Fore wing ochreous yellow, with blood-red or purplish-red markings; costal edge red; a diffused red antemedial line angled outwards in submedian fold where there is a spot beyond it; a small spot in middle of cell and discoidal lunule constricted at middle; a diffused subterminal band with series of white points near its outer edge, oblique from below apex to discal fold, then excurved and formed of somewhat dentate marks to submedian fold where there is a small spot before it: a terminal series of red points. Hind wing white, the terminal area tinged with yellow.

Hab. N.E. RHODESIA, upper Luangwa valley (*Neave*), 1 ♂, 1 ♀ type. *Exp.* 26 mm.

TIMORA LANCEOLATA Wlk. xxxiii. 767 (1865).

CONGO, Katanga, Kambove.

TIMORA DAPHŒNA, sp. n. (Pl. XXXVI. fig. 29.)

♂. Head and thorax deep pink; palpi fuscous; antennæ brownish; pectus and legs ochreous white tinged with pink;

abdomen ochreous white. Fore wing deep glossy pink; costal edge whitish; median nervure and bases of veins 4, 3 white; a white fascia in submedian fold, another in discal fold from end of cell to near termen, and a short streak above terminal part of vein 6; cilia brownish tinged with pink and with fine white line at base. Hind wing ochreous white, the termen faintly tinged with pink; the underside with the costal area tinged with pink.

Hab. N.E. RHODESIA, upper Luangwa valley (*Neave*), 2 ♂ type. *Exp.* 34 mm.

ADISURA ATKINSONI Moore, P. Z. S. 1881, p. 368, pl. 37. f. 6.

N.E. RHODESIA, Luangwa.

AGROTIS LEUCOGASTER Frr. Neu. Beitr. Schmett. i. p. 38, pl. 21 (1831).

N.E. RHODESIA, Serenji distr.

HADENINÆ.

CHABUATA RUFILINEA, sp. n. (Pl. XXXVI. fig. 35.)

♂. Head, thorax, and abdomen yellow tinged with rufous. Fore wing yellow irrorated with rufous, the veins of terminal half streaked with rufous; antemedial line rufous, slightly bent inwards to costa, then erect; a slight rufous discoidal striga; postmedial line rufous, slightly bent outwards below costa, then oblique; subterminal line rufous, slightly excurved at vein 7 and bent outwards to tornus; a fine rufous terminal line. Hind wing pale yellow slightly tinged with brown except on basal and costal areas; a fine brown terminal line; cilia yellow; the underside yellowish white.

Hab. N.W. RHODESIA, Alala plateau (*Neave*), 1 ♂ type. *Exp.* 30 mm.

DIAPHONE EUMELA Stoll, Pap. Exot. iv. pl. 347. f. G (1781).

N.E. RHODESIA, Lukashashi R.

CIRPHIS LOREYI Dup. Lép. Fr. vii. p. 81, pl. 105. f. 7 (1827).

CONGO, Katanga distr.

CIRPHIS NEBULOSA Hmpsn. Ann. S. Afr. Mus. ii. p. 274 (1902).

N.E. RHODESIA, Luangwa valley.

CIRPHIS DIALEUCA, sp. n. (Pl. XXXVI. fig. 36.)

♂. Abdomen with lateral tufts of black hair from base; wings on underside suffused with silvery scales.

Head and thorax brownish ochreous tinged with dark brown; tegulæ with two dark medial lines and a line near tips; abdomen whitish tinged with ochreous brown, the lateral tufts from base black. Fore wing pale pink irrorated with a few black scales, the costal edge ochreous, the veins finely streaked with white, the median nervure and vein 4 to near termen with a stronger streak defined above and below by brownish ochreous, the veins of terminal half defined by fine blackish streaks and the interspaces of terminal half with fine black streaks; a black point at lower angle of cell; a diffused oblique whitish fascia from apex to beyond lower angle of cell; a fine black terminal line; cilia white at base and with three fine brown lines through them. Hind wing white, the veins and terminal area except towards apex suffused with brown; cilia white. Underside of both wings white clothed with silvery scales except basal costal and inner areas; the costa pink; a terminal series of black points.

Hab. N.E. RHODESIA, Luangwa valley (*Neave*), 1 ♂, E. Luangwa distr. (*Neave*), 2 ♂ type. *Exp.* 36 mm.

CIRPHIS POLYRHABDA Hmpsn. Cat. Lep. Phal. B. M. v. p. 507, pl. 92. f. 13 (1905).

N.W. RHODESIA, Alala plateau.

CIRPHIS INSULICOLA Guen. Noct. i. p. 82 (1852).

N.W. RHODESIA, Alala plateau.

CIRPHIS PHÆA Hmpsn. Ann. S. Afr. Mus. ii. p. 275 (1902).

N.E. RHODESIA, Luangwa valley, Kalungwisi valley.

CIRPHIS CORTICEA, sp. n. (Pl. XXXVI. fig. 19.)

♀. Head and thorax purplish brown mixed with black and some greyish; abdomen grey-brown. Fore wing purplish red-brown thickly irrorated with black; antemedial line indistinct, blackish, excurved; a black discoidal striga; postmedial line blackish, oblique and slightly sinuous from costa to vein 4, then inwardly oblique, a series of minute black streaks followed by minute white streaks beyond it on the veins. Hind wing grey-brown.

Hab. N.E. RHODESIA, upper Luangwa valley (*Neave*), 1 ♀ type. *Exp.* 32 mm.

BOROLIA TORRENTIUM Guen. Noct. i. p. 88 (1852).

N.E. RHODESIA, Luangwa valley.

BOROLIA ROSESCENS, sp. n. (Pl. XXXVI. fig. 9.)

♀. Head and thorax pink mixed with some white; abdomen white tinged with ochreous, ventrally suffused with pink. Fore wing pink, the costal edge white; a blackish point at lower angle of cell; a fine whitish line at base of cilia. Hind wing pure white; the underside with the costal area suffused with pink and sparsely irrorated with black, a terminal series of black points from apex to vein 3.

Hab. N.E. RHODESIA, Lake Bangweolo (*Neave*), 1 ♀ type. *Exp.* 40 mm.

CUCULLIANÆ.

RHODOCHLÆNA CUNEIFERA, sp. n. (Pl. XXXVI. fig. 18.)

Antennæ of male bipectinate, with moderate branches to apex.

♂. Head and thorax dark brown mixed with some rufous and grey; tarsi ringed with white; abdomen dark red-brown mixed with grey. Fore wing rufous mixed with some greyish, the medial area dark brown except towards costa; subbasal line represented by a black striga from costa and a small angled white mark defined below by black below the cell, with a dark shade from it to inner margin; antemedial line indistinctly double filled in with rufous, excurved below costa and obliquely excurved from cell to inner margin; orbicular and reniform rufous mixed with whitish and with silvery white annuli defined by black, open above, confluent on median nervure, and the orbicular extending to well below the cell; postmedial line black defined on outer side by white, slightly bent outwards below costa, then minutely waved, incurved below vein 4, some white points beyond it on costa; subterminal line formed by slight white lunules defined on inner side by black lunules, slightly angled outwards at vein 7 and incurved at discal fold and below vein 3; a terminal series of slight white points; cilia chequered with white at tips. Hind wing yellowish white, the veins and costal and terminal areas suffused with red-brown; a brown spot at upper angle of cell; the underside yellowish white irrorated with red-brown except on basal inner area, a black spot on upper discocellular and minutely waved postmedial line.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♂ type. *Exp.* 30 mm.

ACRONYCTINÆ.

TRACHEA CONSUMMATA Wlk. xi. 591 (1857).

N.E. RHODESIA, Fort Jameson.

.**MATOPO NIGRIVITTATA** Hmpsn. Ann. S. Afr. Mus. ii. p. 291 (1902).

N.E. RHODESIA, Serenji distr.

DELTA PHŒNICRASPIS Hmpsn. Cat. Lep. Phal. B. M. ix. p. 521, pl. 148, f. 1 (1910).

N.W. RHODESIA, Kapopo.

PRODENIA LITURA Fabr. Syst. Ent. p. 501 (1775).

N.E. RHODESIA, E. Luangwa distr.

ATHETIS POLIOSTROTA Hmpsn. Cat. Lep. Phal. B. M. viii. p. 304, pl. 129. f. 13 (1909).

N.E. RHODESIA, upper Luangwa valley, Chinsali distr.

ATHETIS ATRILUNA Guen. Noct. i. p. 252 (1852).

N.E. RHODESIA, Serenji distr.

ATHETIS SATELLITIA Hmpsn. Ann. S. Afr. Mus. ii. p. 302 (1902).

N.W. RHODESIA, Alala plateau.

ATHETIS CROCEIPUNCTA Hmpsn. Cat. Lep. Phal. B. M. viii. p. 343, pl. 130. f. 12 (1909).

N.E. RHODESIA, E. Luangwa distr., upper Luangwa valley.

ARIATHISA EXCISA Herr.-Schäff. Aussereur. Schmett. f. 129 (1850).

N.E. RHODESIA, Tanganyika plateau.

ETHIOPICA POLYASTRA Hmpsn. Cat. Lep. Phal. B. M. viii. p. 419, pl. 133. f. 6 (1909).

CONGO, Katanga, Kambove.

PROXENUS CAMPTOGRAMMA Hmpsn. Cat. Lep. Phal. B. M. ix. p. 523, pl. 148. f. 13 (1910).

N.W. RHODESIA, Alala plateau.

PERIGEA CAPENSIS Guen. Noct. i. p. 213 (1852).

N.E. RHODESIA, Luangwa valley; N.W. RHODESIA, Kapopo.

ETHIOTERPIA NEAVI Hmpsn. Cat. Lep. Phal. B. M. ix. p. 112 (1910).

N.E. RHODESIA, Tanganyika plateau.

HYPERCALYMNIA METAXANTHA Hmpsn. Cat. Lep. Phal. B. M. ix. p. 185 (1910).

CONGO, S.E. Katanga.

CIRRODES PHŒNICEA Hmpsn. Cat. Lep. Phal. B. M. ix. p. 210 (1910).

N.E. RHODESIA, E. Luangwa distr.

CALAMISTIS FUSCA Hmpsn. Ann. S. Afr. Mus. ii. p. 296 (1902).

CONGO, S.E. Katanga.

SESAMIA EPUNCTIFERA Hmpsn. Ann. S. Afr. Mus. ii. p. 298 (1902).

N.E. RHODESIA, Luangwa valley.

MAZUCA STRIGICINCTA Wlk. xxxv. 1777 (1866).

N.E. RHODESIA, E. Luangwa distr.

Leucovis alba Roths. Nov. Zool. iv. p. 183 (1897).

N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley, Fort Jameson.

Erastrianæ.

Amyma ruptirena, sp. n.

♂. Head and thorax dark reddish brown mixed with some grey; pectus whitish; tibiæ and tarsi fuscous ringed with white; abdomen grey-brown, the ventral surface white at base. Fore wing red-brown suffused with dark greyish brown; subbasal line represented by a whitish striga from costa; antemedial line brown slightly defined on outer side by whitish, somewhat sinuous, oblique from costa to median nervure beyond the fovea, then inwardly oblique; reniform broken up into small white spots of which the two at lower angle of cell are elongate, and with white striga above it from costa; postmedial line blackish, minutely dentate and produced to a series of white points, excurved from costa to vein 4, then oblique, some white points beyond it on costa; subterminal line indistinct, dark, with white bar from costa, excurved below vein 7 and at middle; a terminal series of minute black and white points. Hind wing dark greyish brown; a fine dark terminal line, and some whitish on termen at tornus; cilia with a fine pale line at base and whitish tips; the underside white irrorated with rufous especially on apical area, a blackish discoidal spot, postmedial line with minute dark streaks and white points at the veins, and terminal series of minute triangular black marks.

Hab. N.E. Rhodesia, Tanganyika plateau, Lofu valley (*Neave*), 1 ♂ type. *Exp.* 26 mm.

Amyna octo Guen. Noct. i. p. 233 (1852).

N.W. Rhodesia, Alala plateau, Kapopo; N.E. Rhodesia, E. Luangwa distr., N. Luangwa, Chambezi valley, Bangweolo distr., Mansya R.

Amyna punctum Fabr. Ent. Syst. iii. 2. p. 34 (1794).

N.W. Rhodesia, Alala plateau, Kapopo; N.E. Rhodesia, E. Luangwa distr., N. Luangwa, Tanganyika plateau, Kalungwisi valley, Mansya R.

Lithacodia blandula Guen. Maillard's Réunion, Lép. p. 38 (1863).

N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley.

Ozarba corniculans Wllgrn. Wien. Ent. Mon. iv. p. 173 (1860).

N.E. Rhodesia, E. Luangwa distr., Chinsali distr.

Ozarba perplexa Saalm. Lep. Madag. p. 281, f. 161 (1891).

N.E. Rhodesia, Luangwa R.

OZARBA PHÆOCROA, sp. n.

♂. Head and thorax dark brown slightly mixed with grey; tarsi blackish ringed with white; abdomen brownish ochreous irrorated with fuscous. Fore wing fuscous tinged with greyish and irrorated with black; traces of a double minutely waved black subbasal line from costa to submedian fold; antemedial line double, black filled in with greyish, minutely waved, oblique; orbicular absent; reniform with faint whitish annulus, narrow and constricted at middle; postmedial line indistinctly double filled in with greyish, excurved from below costa to vein 4, then slightly incurved and oblique to inner margin near tornus, some white points beyond it on costa; subterminal line indistinct, whitish very near termen, slightly excurved below vein 7 and at middle; a terminal series of small black lunules defined by a waved whitish line. Hind wing dark cupreous brown; a dark terminal line with faint pale spots before it; the underside brownish white thickly irrorated with black, a black discoidal spot, traces of a pale curved postmedial line, and a series of whitish spots just before termen.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♂ type. *Exp.* 26 mm.

OZARBA HEMIMELÆNA, n. n.

Tarache transversa Pag. in Voeltzkow, Reis in Ostafrika, ii. p. 109, pl. 6. f. 18 (1907), nec Moore, 1884.

N.W. RHODESIA, Kafue R.; N.E. RHODESIA, Chambezi valley.

OZARBA HELIASTIS Hmpsn. Ann. S. Afr. Mus. ii. p. 410 (1909).

N.E. RHODESIA, E. Luangwa distr.

OZARBA SUBTERMINALIS, sp. n.

♀. Head, thorax, and abdomen black-brown mixed with white; palpi, pectus, legs, and ventral surface of abdomen yellowish white irrorated with brown. Fore wing black-brown mixed with white; subbasal line white, oblique, dentate, from costa to median nervure; antemedial line double filled in with white and defined by white on outer side except at costa, slightly angled outwards below costa, then minutely waved; orbicular represented by minute obliquely placed white spots in cell and on median nervure with black points in centres; reniform with brown centre and white annulus, narrow, constricted at middle and rather oblique; postmedial line double filled in with white, oblique from costa to vein 6, then inwardly oblique, minutely waved and slightly angled outwards at vein 1, some white points beyond it on costa; subterminal line white, minutely waved, excurved below vein 7, incurved below vein 3 and bent outwards to tornus; a black terminal line defined on inner side by white except at apex. Hind wing orange, the base suffused with brown extending above vein 1 to the rather diffused dark postmedial line, with a diffused dark patch beyond it at apex; a black terminal line except at tornus; cilia white and black. Underside of fore wing yellow suffused and irrorated with brown, the inner area whitish, a dark discoidal spot, indistinct postmedial and subterminal lines, and a diffused apical patch; hind wing with the costal and inner areas irrorated with fuscous, a black discoidal spot, indistinct and incomplete postmedial line and diffused subterminal band.

♂. Fore wing without white line before the terminal black points; hind wing with the brown suffusion at base slight, the subterminal band more or less interrupted and with streaks beyond it towards apex.

Hab. N.E. RHODESIA, upper Luangwa valley (*Neave*); MASHONALAND, Salisbury (*Marshall*), 1 ♀ type; BECHUANALAND, L. Ngami (*Lugard*), 1 ♂; TRANSVAAL, Warmbad (*Janse*), 1 ♂. *Exp.* 20–24 mm.

OZARBA APICALIS, sp. n.

Head and thorax fuscous brown mixed with greyish; abdomen fulvous suffused with fuscous and with white segmental lines on basal segments; pectus, legs, and ventral surface of abdomen whitish irrorated with brown, the fore tibiæ and the tarsi black ringed with white. Fore wing reddish brown suffused and irrorated with fuscous and mixed with some whitish; subbasal line represented by slight obliquely placed whitish spots below costa and cell; antemedial line double filled in with white and defined on outer side by white, minutely waved and slightly curved; orbicular represented by obliquely placed whitish points defined by black in cell and on median nervure; reniform with brown centre and white annulus, narrow and slightly angled inwards on median nervure; an indistinct oblique waved dark line from lower angle of cell to inner margin; postmedial line double filled in with white, minutely waved, oblique from costa to vein 6, slightly incurved at discal fold, incurved below vein 4 and slightly angled outwards at vein 1, some white points beyond it on costa; subterminal line white, slightly angled inwards at discal fold, incurved below vein 3 and bent outwards to tornus towards which it is yellowish; a minutely waved black terminal line defined on inner side by yellow except at apex; cilia blackish with a white patch at apex. Hind wing deep orange; diffused brown streaks at base in and below cell and on inner area; a large black apical patch and obsolescent subterminal line; a black terminal line; cilia blackish with whitish patch at tips below apex. Underside of fore wing orange with black discoidal striga, postmedial point on costa, and apical patch with white points on costa and slight subterminal yellow marks, the patch extending subterminally to vein 4, a terminal series of minute black lunules; hind wing with the costal area irrorated with red, a black discoidal point, traces of a red postmedial line from costa to discal fold and with black points at costa and discal fold, subterminal black band from costa to vein 4 with streaks beyond it towards apex.

Hab. Br. E. Africa, Bondoni plains (*Crawshay*), 1 ♂, Machakos (*Crawshay*), 1 ♂, 4 ♀ type; N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley, Chambezi valley (*Neave*). *Exp.* 24–26 mm.

Ozarba hemichrysea, sp. n.

♂. Head and thorax black mixed with some grey; palpi, pectus, and legs whitish irrorated with black, the tarsi banded with black; abdomen orange irrorated with black, ventrally whitish irrorated with black. Fore wing blackish mixed with grey, the area towards tornus more purplish, the apical area chocolate-brown; a subbasal blackish mark on median nervure; antemedial line ill-defined, blackish, curved and slightly waved; orbicular represented by a whitish point above median nervure; reniform with slight incomplete whitish annulus faintly defined by black, constricted at middle; postmedial line double and filled in with ochreous white towards costa, slightly excurved from below costa to vein 4, then incurved and oblique to inner margin near tornus, some whitish points beyond it on costa; subterminal line represented by faint whitish and black marks, slightly excurved below vein 7 and ending on termen at submedian fold; a black terminal line defined on inner side by whitish; cilia with a whitish patch below apex. Hind wing orange, the costal area suffused with black-brown; a diffused black-brown streak in submedian fold, not reaching termen, and the inner margin suffused with black-brown; a black terminal line; cilia blackish with whitish patches at apex and discal fold. Underside of fore wing orange irrorated with black, a black discoidal spot and streak in submedian fold, a wedge-shaped patch from apical part of costa to submedian fold; hind wing with black discoidal spot, indistinct waved postmedial line, and rufous wedge-shaped patch from apex to vein 2 with black point below it on vein 1.

Hab. Congo, Katanga, Kambove (*Neave*), 1 ♂ type. *Exp.* 20 mm.

Ozarba chryseiplaga, sp. n.

♀. Head yellowish mixed with black; palpi black at tips; thorax purplish fuscous; pectus and legs whitish mixed with brown, the tarsi blackish ringed with yellowish white; abdomen orange dorsally banded with fuscous, ventrally irrorated with black. Fore wing purplish fuscous, the outer half of medial area and the terminal area suffused with cupreous brown except towards inner margin; indistinct waved black antemedial and medial lines; reniform with faint whitish annulus slightly defined by black, constricted at middle; postmedial line black with a small whitish spot before it at costa, excurved from below costa to vein 4, then incurved, some slight whitish points beyond it on costa; subterminal line with oblique yellowish white mark from costa, then represented by faint dentate blackish and grey marks; a terminal series of black striæ; cilia white at tips towards apex. Hind wing black-brown with large orange patch on inner area from near base to beyond middle, not extending to inner margin, and expanding beyond the cell to vein 6, a dark streak on it on vein 1 and traces of a medial line; cilia whitish at tips at apex. Underside of fore wing with orange fascia on basal half of costa, a small spot beyond it before the oblique narrow orange postmedial band slightly excurved at middle; hind wing orange with black patch on middle of costa and a discoidal lunule, the terminal area black, expanding towards costa, its inner edge irregularly sinuous, a series of small yellowish white spots just before termen.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀ type. *Exp.* 20 mm.

EUSTROTIA ALBISIGNA, sp. n.

♀. Head, thorax, and abdomen brown mixed with grey, the last with the anal tuft and ventral surface whitish. Fore wing grey-brown slightly irrorated with fuscous brown; antemedial line slight, brown, angled outwards below costa and in cell, then sinuous; claviform and orbicular absent; reniform with brown centre and white annulus, obsolescent on outer side above, oblique elliptical, some dark suffusion before it; postmedial line dark, bent outwards at vein 7, incurved at discal fold, oblique from vein 4 to submedian fold and bent outwards above inner margin, some white points beyond it on costa; subterminal line double, dark filled in with olive, minutely waved, excurved below vein 7 and at middle, an oblique dark shade before it from below costa to vein 4; a terminal series of black and white points. Hind wing dark grey-brown; a fine black terminal line; the underside whitish irrorated with brown, a slight discoidal point, curved postmedial line, and diffused subterminal shade.

Ab. 1. Fore wing with the reniform more triangular and filled in with white.

Hab. N.E. RHODESIA, Kalungwisi valley (*Neave*), 1 ♀ type, Chambezi valley (*Neave*), 1 ♀. *Exp.* 24 mm.

EUSTROTIA MICROPIS, sp. n.

♂. Head, thorax, and abdomen dark brown mixed with grey and slightly tinged with rufous; tarsi black ringed with white. Fore wing dark glossy brown, the inner half rufous to end of cell; very faint traces of a sinuous antemedial line; orbicular and reniform minute, white ringed with black, the former round; an indistinct sinuous brown line from lower angle of cell to inner margin; terminal area slightly tinged with grey, the veins and interspaces streaked with black; cilia with a rather punctiform whitish line at base. Hind wing greyish wholly suffused with glossy brown; the underside whitish irrorated with brown.

Hab. CONGO, Katanga distr. (*Neave*), 1 ♂ type. *Exp.* 22 mm.

CORGATHA HYPOXANTHA, sp. n.

♂. Head, thorax, and abdomen yellow strongly suffused with rufous; pectus, legs, and ventral surface of abdomen yellow. Fore wing yellow strongly suffused with rufous and irrorated with red-brown, the costa and terminal area tinged with grey-brown; antemedial line brown, waved; a blackish point in middle of cell; medial line brown, slightly sinuous; postmedial line brown excurved below costa, at middle and to inner margin, with white points on its outer edge at veins 7, 6, 4, 3, 1; subterminal line brown, excurved below vein 7 and at middle and slightly waved; a series of black points just before termen; a fine terminal red line; cilia with a red line at middle. Hind wing yellow suffused with rufous and irrorated with red-brown; an indistinct oblique brown antemedial line; postmedial line indistinct, brown, excurved at middle and with slight black and white points on its outer edge at veins 4, 3, 2; an indistinct waved brown subterminal line; a series of minute black points just before termen; a fine red terminal line; cilia pencilled with red. Underside of both wings yellow, the apex of fore wing irrorated with rufous.

Hab. N.E. RHODESIA, E. Luangwa distr. Petauke (*Neave*), 1 ♂ type, Kalungwisi distr. (*Neave*), 1 ♂. *Exp.* 26 mm.

EUBLEMMA TRIGRAMMA, sp. n.

♂. Head white tinged with rufous; tegulæ pale rufous; thorax and abdomen white tinged with brown; pectus, legs, and ventral surface of abdomen white tinged with pale rufous. Fore wing creamy white suffused with brown leaving the costal area white to near apex, the termen bright rufous; antemedial line brown defined on inner side by white, very oblique, arising from below costa beyond middle; postmedial line creamy white, very oblique, arising from apex and crossing the slight punctiform dark subterminal line which is oblique below vein 4; cilia brown with white line at base except at tornus. Hind wing creamy white, the terminal half of inner margin and the termen suffused with brown and tinged with rufous; cilia white tinged with rufous at base; the underside creamy white, the apical area suffused with fiery red.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*); MASHONALAND, Umtali (*Marshall*), 1 ♂ type. *Exp.* 22 mm.

EUBLEMMA FŒDOSA Guen. Noct. ii. p. 254 (1852).

N.E. RHODESIA, Chambezi valley.

THYATIRINA ACHATINA Weym. Berl. Ent. Zeit. 1896, p. 90.

CONGO, S.E. Katanga: N.E. RHODESIA, E. Luangwa distr.

HICCODA DOSAROIDES Moore, Lep. Atk. p. 135 (1882).

PORTUGUESE E. AFRICA, Chinde.

TARACHE ZELLERI Wllgrn. Anteckn. i Zool. i. p. 59 (1856).

N.E. RHODESIA, upper Luangwa valley.

TARACHE GRATIOSA Wllgrn. Anteckn. i Zool. i. p. 59 (1856).

N.E. RHODESIA, E. Luangwa distr., upper Luangwa valley, Fort Jameson.

TARACHE NIPHOGONA Hmpsn. Trans. Zool. Soc. xix. p. 109, pl. 4. f. 17 (1909).

N.W. RHODESIA, Alala plateau.

TARACHE DISCOIDEA Hopff. Peters' Reise Mossamb. p. 433, pl. 28. f. 9 (1862).

N.E. RHODESIA, E. Luangwa distr.

EULOCASTRA ÆTHIOPS Dist. A. M. N. H. (7) i. p. 223 (1898).

CONGO, Katanga, Kambove.

MIMASURA QUADRIPUNCTA, sp. n.

Head and tegulæ orange; thorax ochreous white; pectus, legs, and abdomen orange. Fore wing ochreous white, the costa narrowly orange; obliquely placed ante- and postmedial small black spots in submedian fold and on inner margin; cilia tinged with yellow. Hind wing pale yellow.

Hab. N.E. RHODESIA, Luangwa valley (*Neave*), 1 ♂, 1 ♀ type. *Exp.* ♂ 26, ♀ 30 mm.

MIMASURA INNOTATA, sp. n.

♂. Head, thorax, and abdomen ochreous white slightly tinged with brown; palpi orange-yellow. Fore wing silky ochreous white, the costal edge yellow. Hind wing whitish suffused with fuscous brown. Underside of fore wing suffused with fuscous brown.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♂ type. *Exp.* 20 mm.

HYPOSADA HYDROCAMPATA Guen. Ur. & Phal. ii. p. 438 (1857).

N.E. RHODESIA, Luangwa R.

EUTELIANÆ.

EUTELIA OPERATRIX Wllgrn. Wien. Ent. Mon. iv. p. 170 (1860).

N.E. RHODESIA, E. Luangwa distr.

EUTELIA SYMPHONICA Hmpsn. Ann. S. Afr. Mus. ii. p. 309 (1902).

N.E. RHODESIA, Serenji distr., Petauke distr.

EUTELIA CYANOLOPHA Hmpsn. A. M. N. H. (7) xvi. p. 384 (1905).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

Eutelia polychorda Hmpsn. Ann. S. Afr. Mus. ii. p. 308 (1902).

N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley; N.W. Rhodesia, Alala plateau.

Stictopterinæ.

Stictoptera pœcilosoma Saalm. Ber. Senck. Ges. 1880, p. 276; id. Lep. Madag. p. 491, ff. 99, 100, 121, 124, 125.

Germ. E. Africa, Dar-es-Salaam.

Stictoptera litigiosa Boisd. Faun. Ent. Madag. & Maur., Lép. p. 93, pl. 16. f. 3 (1833).

N.E. Rhodesia, E. Luangwa distr., Luangwa valley, Chambezi valley.

Stictoptera methyalea Hmpsn. Ann. S. Afr. Mus. ii. p. 309 (1902).

Congo, Katanga, Kambove; N.E. Rhodesia, E. Luangwa distr., Bangweolo distr.

Acontianæ.

Paraxestis irrorata, sp. n. (Pl. XXXVI. fig. 10.)

♂. Head and thorax whitish ochreous tinged with rufous and irrorated with fuscous; antennæ tinged with rufous; abdomen ochreous dorsally suffused with rufous. Fore wing whitish ochreous slightly tinged with rufous and irrorated with black; antemedial line very indistinct, angled outwards on median nervure; a black discoidal point; postmedial line very indistinct and oblique from costa to vein 6, then pale rufous, strongly incurved below vein 5; a faint diffused rather maculate subterminal blackish shade, excurved below costa; cilia blackish at tips. Hind wing yellowish white with slight rufous terminal line except towards tornus; the underside with the costal area white.

Hab. N.E. Rhodesia, Luangwa R. (*Neave*), 1 ♂ type. *Exp.* 26 mm.

Arcyophora longivalvis Guen. Noct. ii. p. 379, pl. 12. f. 9 (1852).

N.W. Rhodesia, Alala plateau.

Arcyophora fuscicona, sp. n. (Pl. XXXVI. fig. 11.)

♂. Head, thorax, and abdomen pale rufous; palpi black, white at tips; lower part of frons black with white spot; antennæ tinged with fuscous; pectus and legs greyer, the fore legs fuscous in front, the mid and hind tibiæ and tarsi irrorated with fuscous. Fore wing greyish suffused with rufous and slightly irrorated with fuscous; a conical black-brown patch on middle of costa;

a minute blackish point at lower angle of cell; a diffused fuscous subterminal shade, angled outwards below vein 7 and at middle. Hind wing silky ochreous suffused with reddish brown; cilia whitish at tips; the underside whitish irrorated with brown.

♀. Head, thorax, and fore wing much greyer and with hardly any rufous tinge.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 2 ♀; PORTUGUESE E. AFRICA, Chinde (*Neave*), 1 ♂ type. *Exp.* 26 mm.

METACULASTA ENDOGLAUCA, sp. n. (Pl. XXXVI. fig. 20.)

♂. Head and thorax grey mixed with white; abdomen ochreous white dorsally tinged with rufous. Fore wing yellowish white, the costal area suffused with rufous to beyond middle, the inner area, and the terminal area slightly, suffused with grey; the subcostal nervure defined by slight rufous streaks on basal half; a rufous streak below base of cell; a very oblique rufous striga from costa before middle to upper angle of cell and a slight oblique yellowish line from lower angle of cell to inner margin near base; postmedial line rufous and very oblique from costa to vein 6 below apex, where it is met by an oblique fuscous streak from apex, then oblique and somewhat dentate to inner margin before middle; the costal area towards apex with some dark irroration and the veins defined by slight dark streaks; a faint obliquely curved dark subterminal shade arising below apex; cilia brownish. Hind wing ochreous white, the termen tinged with brown.

Hab. N.E. RHODESIA, Chinsali distr. (*Neave*), 1 ♂ type. *Exp.* 24 mm.

URBONA LACTEATA, sp. n. (Pl. XXXVI. fig. 21.)

Head, thorax, and abdomen creamy white, the palpi tinged with rufous behind, the antennæ tinged with fuscous. Fore wing creamy white irrorated with a few black-brown scales; a black discoidal point; postmedial line brown, arising very near apex, angled outwards below apex, then very oblique and slightly sinuous to middle of inner margin, some dark points on it towards apex; a slight oblique minutely waved brownish subterminal line somewhat excurved at middle; a terminal series of black striæ; cilia finely pencilled with brown. Hind wing ochreous white.

Hab. N.E. RHODESIA, N. Luangwa, Mt. Ulungu (*Neave*), 1 ♂, 1 ♀ type, Luangwa R., 1 ♂. *Exp.* 26 mm.

URBONA NIVEA Hmpsn. Ann. S. Afr. Mus. ii. p. 315 (1902).

N.E. RHODESIA, Chambezi valley.

ACONTIA GRAELLSI Feisth. Ann. Soc. Ent. Fr. vi. p. 300, pl. 12. f. 3 (1837).

N.E. RHODESIA, Bangweolo distr.

EARIAS INSULANA Boisd. Faun. Ent. Madag. & Maur., Lép. p. 121, pl. 16. f. 9 (1833).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

ERIZADA ESMERALDA, sp. n. (Pl. XXXVI. fig. 16.)

♂. Head and thorax pale emerald-green; pectus and legs white; abdomen brownish ochreous, ventrally whitish. Fore wing pale emerald-green; a subbasal black point on costa; antemedial line fine, white defined on outer side by a black striga from costa, slightly angled outwards below costa, then oblique; a minute black discoidal point; postmedial line fine, white, defined on inner side by a black striga from costa, slightly bent outwards below costa, then somewhat excurved and incurved below vein 4; the costa towards apex rufous with slight dark marks on it; traces of a minutely dentate dark subterminal line; cilia blackish at base, rufous at tips. Hind wing ochreous yellow with a diffused dark streak below extremity of vein 2; cilia white at tips except at apex; the underside with the apex tinged with rufous.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♂ type. *Exp.* 22 mm.

WESTERMANNIA ŒDIPLAGA, sp. n. (Pl. XXXVI. fig. 27.)

♀. Head, thorax, and abdomen ochreous grey irrorated with brown; palpi with the second joint fuscous at sides; fore tibiæ and the tarsi fuscous, the latter with slight pale rings. Fore wing ochreous grey irrorated with brown, the terminal area suffused with rufous except at tornus, the costal edge pale; a large chocolate-brown patch tinged with violaceous grey from costa beyond middle to submedian fold where it ends in a point, its inner edge incurved, its outer strongly excurved and bounded by the fine dark postmedial line slightly defined by whitish on outer side, angled inwards just above submedian fold and excurved to inner margin near tornus; traces of a punctiform dark subterminal line excurved below vein 7; cilia dark brown, white at tips. Hind wing pale suffused with reddish brown, the cilia brown with yellowish line at base and whitish tips; the underside yellowish irrorated with brown, a curved postmedial line.

Hab. N.E. RHODESIA, Luangwa R. (*Neave*), 1 ♀ type. *Exp.* 36 mm.

WESTERMANNIA ALBIGRISEA, sp. n. (Pl. XXXVI. fig. 26.)

Head white tinged with olive-yellow; thorax white, the fore legs brownish in front; abdomen white tinged with brown. Fore wing with the basal area white tinged with violaceous grey, the terminal half violaceous grey, the costal edge rufous; a rather diffused and somewhat inwardly oblique pale olive-yellow medial line with large quadrate silvery white patch beyond it from just below costa to vein 3, defined on outer side by a series of black striæ with some silvery scales on their outer side before the postmedial line, which is indistinct, somewhat excurved below costa and at middle, then bent inwards to near the medial line; traces of a maculate rufous subterminal line, somewhat angled outwards at vein 7 and excurved at middle; a terminal series of grey striæ slightly defined on inner side by white. Hind wing white suffused with brown especially on terminal area; cilia white; the underside white.

Hab. N.E. RHODESIA, Chambezi valley (*Neave*), 1 ♂, 1 ♀ type, L. Bangweolo, E. Luangwa distr. *Exp.* 24 mm.

WESTERMANNIA LUMINOSA Wlk. xv. 1759 (1858).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

CAREA THERMISTIS, sp. n. (Pl. XXXVI. fig. 17.)

♂. Head, thorax, and abdomen rufous mixed with some fuscous. Fore wing pale rufous suffused with some brown on basal costal area, beyond the antemedial line on inner area, and between the postmedial and subterminal lines; antemedial line indistinct, brownish, minutely waved, bent outwards below the cell; a black point in end of cell and whitish discoidal lunule defined on inner side by black; postmedial line rather diffused, brown, oblique from costa to vein 4, angled inwards just above submedian fold and bent outwards to inner margin, a rather oblique diffused dark streak from it to termen below apex; a rather indistinct brown subterminal line, excurved at vein 7 and middle and ending on termen above tornus; a brown apical patch; cilia with some brownish spots. Hind wing yellowish white tinged with rufous, the termen fiery red; cilia whitish at tips; the underside whitish, the marginal areas suffused with fiery red.

Hab. N.E. RHODESIA, Luangwa R. (*Neave*), 1 ♂ type. *Exp.* 32 mm.

CATOCALINÆ.

CYLIGRAMMA LATONA Cram. Pap. Exot. i. p. 20, pl. 13. f. B (1779).

CONGO, Katanga, Kambove, Lualaba R.; N.W. RHODESIA, Kafue R.; N.E. RHODESIA, E. Luangwa distr., Petauke distr., Kalungwisi distr., Bangweolo distr.; PORTUGUESE E. AFRICA, Makanga distr.

CYLIGRAMMA GOUDOTI Guen. Noct. iii. p. 189 (1852).

CONGO, Katanga, Kambove.

CYLIGRAMMA FLUCTUOSA Drury, Ins. Exot. ii. p. 24, pl. 14. f. 1 (1770).

CONGO, Katanga Kambove; N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Chinsali distr., E. Luangwa distr.

CYLIGRAMMA LIMACINA Guér. Icon. R. Anim., Ins. pl. 89. f. 2 (1829).

CONGO, Katanga, Kambove; N.E. RHODESIA, Lualaba R., Kalungwisi distr.

CYLIGRAMMA AMBLYOPS Mab. Bull. Soc. Ent. Fr. 1891, p. xc.

N.E. RHODESIA, Kalungwisi valley.

[*Cyligramma amblyops* Mab. This species and most of its allies are usually to be found only in deep shade in patches of dense forest. They have a clumsy flight and always settle on the ground. The abundant and ubiquitous *C. latona* Cram. is not thus limited to forest, but occurs everywhere and frequently comes to light.—S. A. N.]

CALLIODES APOLLINA Guen. Noct. iii. p. 193 (1852).

N.E. RHODESIA, upper Luangwa valley.

CALLIODES PRETIOSISSIMA Holl. Entom. xxv. Suppl. p. 94 (1892); id. Pr. U.S. Nat. Mus. xviii. p. 254, pl. 8. f. 2.

CONGO, Katanga, Kambove; N.W. RHODESIA, Kafue R.; N.E. RHODESIA, upper Luangwa valley, E. Luangwa distr., Bangweolo distr.

CALLIODES GLAUCESCENS Butl. P. Z. S. 1893, p. 680.

CONGO, Katanga, Kambove; N.E. RHODESIA, Chambezi valley; PORTUGUESE E. AFRICA, Makanga distr.

SPIRAMA CAPENSIS Herr.-Schäff. Aussereur. Schmett. ff. 121, 122 (1850).

CONGO, Katanga, Kambove; N.E. RHODESIA, L. Bangweolo, Kalungwisi valley, E. Luangwa distr., Mansya R.

[*Spirama capensis* H.-Schäff. This species has a very curious habit of settling upon leaves, generally not far from the ground. Attached by the fore legs, it hangs *loosely* from a leaf with expanded wings, the secondaries covering and concealing the abdomen. In this position the insect looks exactly like a dead leaf attached by a cobweb or by damp to a living one. The dark line across both wings represents the midrib of the leaf, and the resemblance is enhanced by the insect resting with the long axis from tip to tip of the wings nearly vertical.—S. A. N.]

SPIRAMA RUFESCENS Kirby, A. M. N. H. (6) xviii. p. 391 (1896).

N.E. RHODESIA, Luangwa R.

SPIRAMA AFRICANA Kirby, A. M. N. H. (6) xviii. p. 392 (1896).

N.E. RHODESIA, Luangwa valley.

Spirama pardus Guen. Noct. iii. p. 205 (1852).

N.E. Rhodesia, Luangwa valley, E. Luangwa distr., Tanganyika plateau.

Audea humeralis Hmpsn. Ann. S. Afr. Mus. ii. p. 327 (1902).

N.E. Rhodesia, Mpika.

Dermaleipa parallelipipeda Guen. Noct. iii. p. 230 (1852).

N.E. Rhodesia, Bangweolo distr.

Ophiusa klugi Boisd. Faun. Ent. Madag. & Maur., Lép. p. 103 (1833).

N.E. Rhodesia, E. Luangwa distr.

Ophiusa xanthoptera, sp. n. (Pl. XXXVI. fig. 22.)

Head and thorax orange; palpi and fore and mid tibiæ brown irrorated with white; tarsi brownish; abdomen pale yellow. Fore wing orange, the costal edge reddish brown; subbasal line represented by a red-brown point below costa and fuscous spot in cell; antemedial line red-brown, minutely waved, oblique to submedian fold, below which there is a fuscous spot before it; orbicular a dark point; reniform an elliptical rufous spot with some fuscous on its inner edge; a lunulate rufous medial line excurved beyond the cell, then incurved; postmedial line formed of rufous lunules, indistinctly double below vein 4, oblique from costa to vein 6, then inwardly oblique; an indistinct minutely waved rufous subterminal line with fuscous spot on it below vein 7; terminal area tinged with rufous except at apex; a series of black points just before termen. Hind wing orange-yellow faintly tinged with rufous; a series of minute dark points just before termen; the underside suffused with rufous and white except on inner area; a black discoidal point, indistinct curved minutely waved postmedial line, and traces of medial and subterminal lines.

Ab. 1. Fore wing with the dark marks on basal area and the spot below vein 7 absent.

Hab. Sierra Leone, 1 ♀; N.W. Rhodesia, Alala plateau (*Neave*), 1 ♂; N.E. Rhodesia, Tanganyika plateau (*Neave*), 1 ♂ type. *Exp.* 66 mm.

Ophiusa albitermia, sp. n. (Pl. XXXVII. fig. 21.)

Head, thorax, and abdomen pale yellow, the last slightly irrorated dorsally with fuscous; palpi, pectus, legs, and ventral surface of abdomen slightly tinged with brown. Fore wing pale yellow slightly irrorated with fuscous, the terminal area whitish, tinged with brown at apex; subbasal line represented by slight dark striæ below costa and cell; antemedial line indistinct, dark, oblique, waved; a dark point in middle of cell and two slight discoidal points; medial line indistinct, double, dark, excurved beyond the cell, then incurved and waved; postmedial line dark, crenulate, slightly curved; subterminal line blackish, oblique from below apex to discal fold, then erect, a brownish tinge beyond it. Hind wing pale yellow, obliquely curved; antemedial and medial lines sometimes present; a postmedial fuscous mark below costa with line from it to tornus; a blackish apical patch with diffused line from it to tornus, the area beyond it whitish; the underside white irrorated with brown, a black discoidal point, indistinct medial and postmedial lines and minutely waved whitish subterminal line incurved below costa.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 2 ♂, 1 ♀ type. *Exp.* 54 mm.

OPHIUSA GONOPTERA, sp. n. (Pl. XXXVII. fig. 13.)

♂. Head and thorax pale olive-brown; palpi blackish irrorated with grey; antennæ, tibiæ, and tarsi fuscous; abdomen pale brown. Fore wing grey-brown suffused with brown and irrorated with black; antemedial line very indistinct, blackish, oblique, strongly angled outwards in submedian fold; a black point in middle of cell; reniform indistinct, brown, defined by white points above on outer side and below on inner and outer sides; postmedial line very indistinct, waved, excurved below costa, then oblique, a paler patch before it in submedian interspace; subterminal line represented by a grey striga from costa, a dentate black mark defined on outer side by grey below apex, then by an incurved series of slight black points and by a faint olive-yellow spot above tornus, an oblique dark striga beyond it from apex; traces of a series of black points before termen and of some black points on termen. Hind wing grey-brown with broad diffused fuscous subterminal shade; cilia whitish from below apex to the lobe. Underside brownish grey; fore wing with slight discoidal lunule, the terminal area broadly suffused with fuscous. Hind wing with the termen lobed at middle.

Hab. N.E. RHODESIA, Luangwa R. (*Neave*), 1 ♂ type. *Exp.* 58 mm.

OPHIUSA TUMIDITERMINA, sp. n. (Pl. XXXVII. fig. 22.)

♂. Head and thorax pale olive-yellow; palpi, tibiæ, and tarsi fuscous irrorated with grey; abdomen pale brownish grey. Fore wing pale olive-yellow slightly irrorated with dark brown; antemedial line brown, indistinct, obsolete towards costa, angled inwards on median nervure and outwards in submedian fold; a black point in middle of cell; reniform pale red-brown defined by some black scales and with white points on its outer side above and on inner and outer sides below; postmedial line brown, obsolete at costa, then oblique sinuous; subterminal line represented by two black-brown lunules below costa defined on outer side by grey and brown, then by an incurved series of grey and brown points on the veins and by two grey spots defined by brown above tornus, the lower one large; a crenulate brown line just before termen with grey points at the veins; cilia grey, brown at base and tips. Hind wing pale reddish brown with broad diffused fuscous subterminal shade; some grey on termen at the lobe; cilia white, fuscous at the lobe. Underside brownish white; fore wing with broad fuscous subterminal shade not reaching inner margin; hind wing with fuscous apical patch.

♀. Head, thorax, and fore wing pale red-brown; underside of hind wing with faint diffused fuscous subterminal shade. Hind wing of male with the termen lobed at middle.

Hab. N.E. RHODESIA, Tanganyika plateau (*Neave*), 1 ♂ type, Chambezi valley (*Neave*), 1 ♀, Lake Bangweolo (*Neave*), 1 ♀, Mansya R., 1 ♀. *Exp.* 58 mm.

OPHIUSA TIRRHACA Cram. Pap. Exot. ii. pl. 172. f. E (1779).

N.E. RHODESIA, E. Luangwa distr.

OPHIUSA TETTENSIS Hopff. Mon. Konigl. Akad. Wissen. 1857, p. 422; id. Peters' Reise Moz., Ins. p. 436, pl. xxviii. f. 12.

N.E. RHODESIA, Luangwa valley.

OPHIUSA DAVID Holl. Psyche, vii. p. 70 (1894).

N.E. RHODESIA, Kalungwisi distr.

OPHIUSA FINIFASCIA Wlk. xv. 1676 (1858).

N.E. RHODESIA, E. Luangwa distr.

OPHIUSA MEJANESI Guen. Noct. iii. p. 232 (1852).

CONGO, Katanga, Kambove; N.E. RHODESIA, upper Luangwa valley, E. Luangwa distr.

OPHIUSA CANCELLATA Saalm. Lep. Madag. p. 414, f. 186 (1891).

N.E. RHODESIA, Luangwa R., E. Luangwa distr.

OPHIUSA FABER Holl. Psyche, vii. p. 69 (1894).

N.E. RHODESIA, upper Luangwa valley.

OPHIUSA BOVIS Geyer, Zütr. Ex. Schmett. ff. 793-4 (1827).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr., Luangwa R., Chambezi valley, Chinsali distr., Bangweolo distr.

OPHIUSA MORMOIDES Wlk. xiv. 1393 (1858).

N.E. RHODESIA, Luangwa R.

OPHIUSA LIENARDI Boisd. Faun. Ent. Madag. & Maur., Lép. p. 102, pl. 15. f. 5 (1833).

CONGO, Katanga, Kambove; N.E. RHODESIA, Lake Bangweolo, Mansya R.

OPHIUSA CATELLA Guen. Noct. iii. p. 247 (1852).

N.W. RHODESIA, Alala plateau, Kafue R.; N.E. RHODESIA, Serenji distr., Bangweolo distr.

OPHIUSA PORPHYRESCENS, sp. n. (Pl. XXXVII. fig. 14.)

Head and thorax brown mixed with purplish grey; abdomen grey suffused with fuscous brown. Fore wing brown suffused with purplish grey and with dark patches on costal area before the postmedial and subterminal lines; antemedial line brown slightly defined on each side by whitish, angled outwards below costa, then oblique; a blackish discoidal line defined on inner side by whitish; an indistinct dark medial line excurved beyond the cell, then sinuous; postmedial line dark defined on outer side by whitish, angled outwards at vein 6, oblique to vein 2, then erect, two white points beyond it on costa; subterminal line indistinct, pale faintly defined on outer side by fuscous, angled outwards at vein 7, then minutely waved and bent outwards to tornus; a series of black points just before tornus; a fine dark terminal line and pale line at base of cilia. Hind wing fuscous brown, the termen tinged with grey; a fine dark terminal line with black points at the interspaces and pale line at base of cilia; the underside whitish suffused and irrorated with brown except on inner area, traces of a dark postmedial line excurved below costa, then oblique, and of a double waved subterminal line.

Hab. N.E. RHODESIA, Chambezi valley (*Neave*), 2 ♂, 1 ♀ type. *Exp.* 44 mm.

OPHIUSA PROXIMA Hmpsn. Ann. S. Afr. Mus. ii. p. 339 (1902).

CONGO, Katanga, Kambove; N.E. RHODESIA, Luangwa R., E. Luangwa distr., Lake Bangweolo, Tanganyika plateau, Mansya R.

OPHIUSA PALPALIS Wlk. xxxiii. 968 (1865).

N.E. RHODESIA, E. Luangwa distr., Luangwa R., Chambezi valley.

OPHIUSA ALGIRA Linn. Syst. Nat. ed. xii. p. 836 (1766).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr., Chambezi valley, Mansya R., Bangweolo distr.

OPHIUSA DEROGANS Wlk. xv. 1832 (1858).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Tanganyika plateau.

OPHIUSA ERECTATA Hmpsn. Ann. S. Afr. Mus. ii. p. 341 (1902).

N.E. RHODESIA, Luangwa R., Kalungwisi valley.

OPHIUSA ABNEGANS Wlk. xv. 1831 (1858).

N.E. RHODESIA, Luangwa R., Kalungwisi valley.

Ophiusa angularis Boisd. Faun. Ent. Madag. & Maur., Lép. p. 103, pl. 13. f. 2 (1833).

N.E. Rhodesia, E. Luangwa distr.

Ophiusa mesonephele, sp. n. (Pl. XXXVII. fig. 23.)

♀. Head, thorax, and abdomen brown tinged with purplish grey; palpi white at extreme tips; tarsi ringed with whitish. Fore wing brown suffused with purple-grey; antemedial line black, rather diffused on inner side, straight, erect; postmedial line with band of black suffusion before it, excurved at discal and submedian folds, some pale points beyond it on costa; two obliquely placed dentate subapical black spots with traces of a waved line from them to inner margin; a fine waved dark terminal line. Hind wing grey-brown with fine waved dark terminal line; the underside grey-brown with slight dark irroration and traces of a curved postmedial line.

Hab. N.E. Rhodesia, Chambezi valley (*Neave*), 2 ♀ type, Mansya R. (*Neave*), 1 ♀. *Exp.* 36 mm.

Ophiusa goniophora, sp. n. (Pl. XXXVII. fig. 15.)

♂. Head and thorax ochreous grey mixed with black; pectus ochreous white; tarsi fuscous with pale rings; abdomen dorsally fuscous, ventrally ochreous white. Fore wing grey-brown with a purplish tinge, the basal half irrorated with black, the area between the medial and postmedial lines suffused with black-brown becoming velvety black at the postmedial line; traces of a fuscous sinuous subbasal line from costa to vein 1; antemedial line indistinctly double, blackish, sinuous; medial line diffused, fuscous, inwardly oblique; postmedial line very acutely angled outwards at vein 6, then strongly incurved and excurved between veins 3 and 2, its angle met by an oblique sinuous streak from apex, the enclosed costal area tinged with rufous and with some pale points on costa; a series of black points just before termen; cilia with a fine pale line at base. Hind wing fuscous brown; the underside greyish suffused and irrorated with fuscous, a black discoidal point and two indistinct postmedial lines excurved below costa.

Hab. Congo, Katanga, Kambove (*Neave*), 1 ♂ type. *Exp.* 52 mm.

Genus Ctenusa, nov.

Type, *C. carnicolor* Hmpsn.

Proboscis fully developed; palpi upturned, the 2nd joint reaching vertex of head and moderately fringed with hair in front, the 3rd moderate, oblique; frons smooth; eyes large, round; antennæ of male bipectinate with moderate branches, the apex simple; thorax clothed with hair only and without crests; tibiæ moderately fringed with hair, the mid and hind tibiæ strongly spined; abdomen without crests. Fore wing broad, the apex rectangular, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hind wing with the termen produced to a slight lobe at vein 4; the cell nearly half the length of wing; veins 3, 4 from angle; 5 from just above angle; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

Ctenusa pallida Hmpsn. Ann. S. Afr. Mus. ii. p. 321 (1902).

N.E. Rhodesia, Kalungwisi distr.

Ctenusa rufirena, sp. n. (Pl. XXXVII. fig. 12.)

♀. Head fiery red, the vertex and tegulæ chocolate-brown; palpi with dark line at sides; thorax and abdomen yellow tinged with rufous, the pectus in front and fringes of hair on fore legs fiery red, the fore tibiæ and tarsi fuscous in front, the former irrorated with white. Fore wing yellow tinged with rufous and irrorated with fuscous; antemedial line indistinct, red slightly defined on inner side by yellow, curved; reniform rufous defined by yellow, an oblique red striga above it from costa; postmedial line red slightly defined on outer side by yellow and with dark striga from costa, excurved below costa, then waved; subterminal line yellow, almost straight; a series of slight red points before termen; cilia red with fine yellow lines at base and middle. Hind wing yellow tinged with rufous and irrorated with fuscous, the costal area whitish to beyond middle; a minutely waved fuscous postmedial line; a faint broad fuscous subterminal shade; cilia with fine yellow lines at base and middle. Underside of fore wing with blackish discoidal striga, hind wing with point, both wings with fuscous subterminal shade.

Hab. N.W. Rhodesia, Alala plateau, Ndola distr. (*Neave*), 1 ♀ type. *Exp.* 54 mm.

Grammodes geometrica Fabr. Syst. Ent. p. 599 (1775).

Congo, Katanga, Kambove; N.W. Rhodesia, Alala plateau; N.E. Rhodesia, Kalungwisi valley, Chambezi valley, Luangwa valley, E. Luangwa distr., Chinsali distr., Bangweolo distr.

Grammodes stolida Fabr. Syst. Ent. p. 599 (1775).

Portuguese E. Africa, Chinde.

Grammodes euclidicola Wlk. xiv. 1438 (1858).

Congo, Katanga, Kambove.

Grammodes benitensis Holl. Psyche, vii. p. 85. pl. ii. f. 25 (1894).

N.E. Rhodesia, Kalungwisi distr., Mansya R.

Grammodes delta Boisd. Faun. Ent. Madag. & Maur., Lép. p. 105, pl. 13. f. 1 (1883).

N.E. Rhodesia, E. Luangwa distr., Chambezi valley.

CHALCIOPE HYPPASIA Cram. Pap. Exot. iii. pl. 250. f. E (1779).

CONGO, Kambove, Katanga; N.E. RHODESIA, E. Luangwa distr., Lake Bangweolo distr., Kalungwisi valley.

CHALCIOPE DITRIGONA, sp. n. (Pl. XXXVII. fig. 5.)

Head, thorax, and abdomen brownish ochreous mixed with some fuscous. Fore wing greyish ochreous tinged with red-brown and irrorated with fuscous; a velvety black triangular mark defined by silvery white, its angles on vein 1 near base and beyond middle and its apex on median nervure; another velvety black triangular patch defined by silvery white on postmedial area, its angles on discocellulars, at vein 7 below apex and above vein 1 towards tornus; two brown subterminal lines bent outwards to apex: a terminal series of black points; cilia whitish with a fuscous line near base. Hind wing grey suffused with brown; a fuscous subterminal shade from apex to vein 2; a terminal series of black points; cilia whitish with a fuscous line from apex to vein 2; the underside white tinged with brown and irrorated with fuscous except on inner area, a faint curved pale postmedial shade from costa to vein 2.

Hab. N.E. RHODESIA, E. Luangwa distr., Petauke (*Neave*), 1 ♂, 1 ♀ type. *Exp.* 42 mm.

CHALCIOPE ALBIFISSA, sp. n. (Pl. XXXVII. fig. 6.)

♀. Head, thorax, and abdomen grey-brown. Fore wing greyish ochreous suffused with red-brown; a velvety black triangular patch, its angles on median nervure near base and lower angle of cell and on vein 1 near tornus, divided by an oblique white streak from another velvety black triangular mark on postmedial area, defined on outer side by white, its angles on discocellulars, on vein 7 below apex and submedian fold above tornus: a fuscous subterminal line diffused on outer side and bent outwards to apex; a fine waved black terminal line; cilia white at tips. Hind wing grey-brown; a fine black terminal line; cilia white at tips; the underside grey suffused with reddish brown.

Hab. N.W. RHODESIA, Alala plateau, Mkushi distr. (*Neave*), 1 ♀ type; N.E. RHODESIA, Bangweolo distr. (*Neave*), 2 ♂. *Exp.* 40 mm.

CHALCIOPE MICROGONIA, sp. n. (Pl. XXXVII. fig. 24.)

♀. Head, thorax, and abdomen grey-brown. Fore wing grey-brown irrorated with fuscous; a triangular velvety black patch in submedian interspace from near base to middle, its outer edge obliquely excised and slightly defined by white; a blackish point in end of cell; a triangular velvety black patch on postmedial area defined on inner and outer sides by whitish, its angles on discocellulars and vein 6 and its apex below vein 2, followed by a rufous band from vein 6 to above inner margin, met at vein 6 by an oblique diffused black fascia from apex, its outer edge then defined by small dentate black marks, the mark above inner margin diffused to tornus; a fine blackish terminal line. Hind wing grey-brown with a broad diffused fuscous subterminal shade; a fine black terminal line; the underside grey-brown tinged with fuscous.

Hab. N.E. RHODESIA, E. Luangwa distr., Petauke (*Neave*), 1 ♀ type. *Exp.* 44 mm.

ATTATHA ETHIOPICA, sp. n. (Pl. XXXVIII. fig. 17.)

Head orange, the frons with black bands at middle and above; palpi with some black above; antennæ blackish; thorax yellow, the tegulæ at tips, the meso- and metathorax with velvety black bands; pectus in front and fore legs orange; abdomen orange above, yellow below. Fore wing ochreous yellow tinged with rufous towards tornus, a triangular velvety black patch in and below base of cell, its outer edge somewhat excised and its lower extremity rather produced; a black fascia on inner margin from near base to beyond middle, its extremities acute; a triangular velvety black patch from middle of costa, its outer edge produced to a point between veins 4, 3 and its lower extremity produced to a long oblique fascia where it is somewhat dilated and squarely truncate; a triangular velvety black patch from costa before apex, its lower extremity obliquely produced to a point near termen below vein 3, rather lobed on outer side, a fine oblique brown line before the patch from vein 7 to below vein 3; a fine black terminal line from apex to vein 4, followed by small spots at veins 4, 3, 2; a few black scales at tornus; cilia black at tips between veins 4 and 2. Hind wing orange-yellow with narrow black band or series of small spots between apex and vein 3, sometimes followed by some points towards tornus; the underside yellow with more or less complete series of small black spots just before termen.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀; N.E. RHODESIA, E. Luangwa distr., Mterize R. (*Neave*), 4 ♂, 6 ♀ type; MOZAMBIQUE, Gorongoza. *Exp.* 44 mm.

COLBUSA EUCLIDICA Wlk. xxxiii. 978 (1865).

N.E. RHODESIA, E. Luangwa distr.

REMIGIA REPANDA Fabr. Ent. Syst. iii. 2. p. 49 (1792).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley, Chinsali distr., Lake Bangweolo, Kalungwisi distr., Mansya R., Mpika.

REMIGIA FRUGALIS Fabr. Syst. Ent. vi. p. 601 (1775).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley, Bangweolo distr.

REMIGIA PERSINUOSA, sp. n. (Pl. XXXVII. fig. 16.)

♂. Head and thorax brownish grey with a few fuscous scales; palpi with the 2nd joint blackish at sides; fore and mid tibiæ and tarsi blackish, the tarsi with pale rings; abdomen brownish grey slightly irrorated with black and dorsally tinged with fuscous except at base. Fore wing brownish grey slightly irrorated with black; a black discoidal point; postmedial line slight, black, outwardly oblique from below costa to vein 6, then inwardly oblique, slightly excurved from vein 5 to below 3, then incurved to below middle of cell, then stronger and angled outwards at vein 1, then bent upwards to submedian fold before middle where it terminates in a minute angle; an oblique rather diffused black streak from apex to vein 4 just beyond postmedial line, with two small obscure black spots on it below apex; a subterminal series of slight black marks from below apex to submedian fold where the mark is further from termen; a terminal series of black points. Hind wing greyish tinged with brown; traces of an oblique fuscous postmedial line; a large fuscous apical patch and faint subterminal shade; a terminal series of black points except towards tornus. Underside of both wings with small discoidal blackish spot, obliquely curved diffused postmedial line except on inner area; fore wing with subterminal shade expanding into a patch below middle; hind wing with faint subterminal shade.

♀. Fore wing with the markings obsolescent.

Hab. CONGO, Katanga, Kambove (*Neave*), 2 ♂ type; N.W. RHODESIA, Kapopo (*Neave*), 1 ♀. *Exp.* 48 mm.

REMIGIA UNDATA Fabr. Syst. Ent. vi. p. 600 (1775).

CONGO, Katanga, Kambove; N.W. RHODESIA, Kapopo; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley, Chinsali distr., Kalungwisi valley, Lake Bangweolo, Tanganyika plateau.

REMIGIA MUTUARIA Wlk. xiv. 1506 (1858).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley, Chinsali distr., Kalungwisi valley, Lake Bangweolo, Tanganyika plateau, Fort Jameson.

REMIGIA JUDICANS Wlk. xv. 1831 (1858).

CONGO, Katanga, Kambove; N.E. RHODESIA, Serenji distr., E. Luangwa distr., N. Luangwa, Mt. Ulungu, Chambezi valley, Kalungwisi valley, Lake Bangweolo; PORTUGUESE E. AFRICA, S. Angoniland.

REMIGIA HETEROCHROA, sp. n. (Pl. XXXVII. fig. 1.)

Head and thorax olive-grey mixed with brown; palpi blackish irrorated with grey; pectus and legs greyer, the tarsi fuscous with pale rings; abdomen grey-brown. Fore wing olive grey-brown irrorated with fuscous; antemedial line blackish, slightly angled outwards below costa, then erect and almost straight; a slight brown discoidal striga; postmedial line indistinctly double, blackish with small black spot at costa, very minutely waved, excurved to vein 4, then erect; subterminal line brown, straight, bent outwards to apex and with three black points on it below apex; a crenulate terminal line; cilia fuscous. Hind wing fuscous brown; traces of a nearly straight postmedial line; subterminal line greyish slightly defined on each side by brown, from vein 4 to tornus: a fine waved dark terminal line; the underside grey thickly irrorated with brown and with traces of a curved postmedial line.

Ab. 1. Head, thorax, and fore wing much more rufous and without any olive-brown tinge or dark irroration, the outer postmedial line with white points on it except towards costa.

Ab. 2. Head, thorax, abdomen, and fore wing much darker and tinged with purplish grey, the last with two small black discoidal spots.

Hab. N.W. RHODESIA, Alala plateau (*Neave*), 3 ♂, 3 ♀ type; N.E. RHODESIA, E. *Luangwa distr.*, 3 ♀, *Luangwa R.*, 1 ♀, *Chambezi valley*, 1 ♂, *Chinsali distr.* (*Neave*), 1 ♂, 1 ♀. *Exp.* ♂ 34, ♀ 38 mm.

REMIGIA GRISEICILIA, sp. n. (Pl. XXXVII. fig. 2.)

♂. Head and thorax grey suffused with rufous; palpi blackish irrorated with white; pectus and legs greyer, the tarsi fuscous ringed with white; abdomen pale reddish brown irrorated with fuscous, ventrally greyer. Fore wing pale greyish rufous slightly irrorated with brown, the terminal area deeper rufous; antemedial line indistinct, brown, slightly sinuous; a slight brown discoidal lunule; postmedial line slight, brown with series of black points on it, oblique to vein 6 and below vein 4; subterminal line very indistinct, greyish with slight dark streak on its outer side, bent outwards to apex, then almost straight; a waved brown terminal line; cilia grey-white with dark lines at middle and tips. Hind wing fuscous brown, the terminal area darker, a faint pale postmedial shade; a fine waved dark terminal line; cilia grey, tinged with brown at base; the underside brownish ochreous irrorated with fuscous, the terminal area suffused with fuscous.

♀. Head, thorax, and fore wing cupreous red.

Hab. N.W. RHODESIA, Alala plateau, Mkushi distr. (*Neave*), 2 ♂, 4 ♀ type. *Exp.* 42 mm.

REMIGIA MOLYBDOPASTA, sp. n. (Pl. XXXVII. fig. 3.)

♀. Head and thorax brown suffused with fuscous; palpi at base, pectus and legs whitish, the tarsi black ringed with white; abdomen red-brown, ventrally whitish. Fore wing fuscous brown suffused with silvery blue especially on costal area to beyond middle, the postmedial area pale reddish brown, whitish at costa; a sinuous black subbasal line from costa to submedian fold; antemedial line black, expanding into a bar at costa, obliquely excurved and slightly sinuous; a faint blackish discoidal lunule; postmedial line black, expanding into a spot at costa, slightly incurved below vein 3; a faint dark subterminal shade towards costa; cilia with some grey at base. Hind wing pale rufous, the basal area tinged with brown, the terminal area suffused with brown; an oblique brown medial line; an oblique rufous subterminal bar from vein 4 to 1; the underside ochreous yellow, a blackish discoidal point, faint oblique postmedial line with some dark points on it, the terminal area suffused with fuscous narrowing to a point at vein 1.

Ab. 1. Fore wing wholly suffused with silvery blue, the postmedial area hardly paler; hind wing darker.

Hab. N.W. RHODESIA, Alala plateau, Udola distr. (*Neave*), 2 ♀ type. *Exp.* 40 mm.

REMIGIA MODERATA Wllgrn. Wien. Ent. Mon. iv. p. 174 (1860).

N.W. RHODESIA, Alala plateau, Kafue R.; N.E. RHODESIA, Luangwa R., Bangweolo distr.

EGYBOLIS VAILLANTINA Stoll, Suppl. Cram. pl. 31. f. 3 (1790).

PORTUGUESE E. AFRICA, Chinde.

PLUSIANÆ.

PLUSIA CHALCYTES Esp. Schmett. pl. 141. f. 3 (1789).

CONGO, Katanga, Kambove; N.W. RHODESIA, Alala plateau, Kapopo; N.E. RHODESIA, Serenji distr., E. Luangwa distr., Luangwa R., Bangweolo distr., Mansya R., Mpika.

PLUSIA FURCIFERA Wlk. xii. 927 (1857).

N.E. RHODESIA, E. Luangwa distr.

PLUSIA ORICHALCIA Fabr. Spec. Ins. ii. 227 (1781).

N.E. RHODESIA, Serenji distr.

NOCTUINÆ.

RHANIDOPHORA CINCTIGUTTA Wlk. Trans. Ent. Soc. (3) i. p. 77 (1862).

CONGO, Katanga, Kambove; N.E. RHODESIA, Kalungwisi valley, Chambezi valley, Chinsali distr., Bangweolo distr.

RHANIDOPHORA RIDENS Hmpsn. Ann. S. Afr. Mus. ii. p. 370 (1902).

CONGO, Katanga, Kambove; N.E. RHODESIA, Serenji distr., E. Luangwa distr.

CALESIA SAMBESITA Wlk. xxxiii. 962 (1865).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley; PORTUGUESE E. AFRICA, Makanga distr., S. Angoniland.

CALESIA ARHODA, sp. n. (Pl. XXXVII. fig. 4.)

♂. Head, thorax, and abdomen dark purplish brown mixed with some grey, the palpi, frons, and anal tuft tinged with ochreous; tarsi with pale rings. Fore wing dark purplish brown irrorated with grey; antemedial and medial lines indistinct, dark, waved; an ochreous white discoidal point; postmedial line indistinct, dark slightly defined on outer side by grey, angled outwards below costa and at middle, then oblique, sinuous; subterminal line indistinct, dark, waved, excurved at middle; an indistinct sinuous dark terminal line. Hind wing dark purplish brown tinged with grey; traces of curved waved dark medial, postmedial, and subterminal lines; an indistinct dark terminal line; the underside greyer with indistinct waved dark medial, postmedial, and subterminal lines.

Hab. N.E. RHODESIA, E. Luangwa distr., Petauke (*Neave*), 1 ♂ type. *Exp.* 36 mm.

CALESIA SOBRINA Möschl. Abh. Senck. Ges. xv. p. 91, pl. f. 13 (1887).

CONGO, Katanga, Kambove.

SPEIREDONIA PLICATA, sp. n. (Pl. XXXVII. fig. 25.)

Fore wing of male with depressed groove in discal fold from before middle to near termen; veins 4, 5 depressed at base.

♂. Head and thorax dark reddish brown; abdomen fuscous brown; palpi in front, pectus, legs, and ventral surface of abdomen greyer. Fore wing greyish brown irrorated and suffused in parts with fuscous; subbasal line indistinct, blackish, from costa to submedian fold; antemedial line indistinctly double, strongly incurved below the cell and excurved above inner margin; a rather diffused medial line, expanding into an obscure annulus below the cell; reniform with faint pale annulus somewhat concave on inner side and displaced towards costa above the fold; postmedial line double, blackish filled in with greyish, waved, excurved from costa to vein 3, then incurved, some pale points beyond it on costa; subterminal line greyish defined on inner side by black suffusion, somewhat dentate, angled outwards at vein 7; a series of small black and whitish spots just before termen; cilia fuscous with a fine pale line at base. Hind wing greyish brown; an indistinct sinuous dark antemedial line; medial line double, blackish filled in with grey, minutely waved, sinuous; postmedial line double, the inner line strong, blackish, minutely waved, sinuous; a series of small black and whitish spots just before termen; a fine pale line at base of cilia; the underside grey-brown with the lines indistinct and more even.

♀. Darker; fore wing with indistinct discoidal bar, the obscure annulus at lower angle of cell.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀; N.E. RHODESIA, N. Luangwa, Mt. Ulungu (*Neave*), 7 ♂, 9 ♀ type; PONDOLAND (*Swinny*), 1 ♀. *Exp.* 48-56 mm.

SPEIREDONIA PRUNICOLORA, sp. n. (Pl. XXXVII. fig. 7.)

Femora and tibiæ of male with fringes of long hair, the mid tibiæ greatly dilated and with thick fringes of hair and scales.

Head and thorax black brown irrorated with grey, the hinder part of thorax with a purplish gloss; palpi streaked with black and ochreous; pectus and legs ochreous white mixed with some brown; abdomen fuscous brown with paler bands on basal segments, the crests with golden metallic scales, the terminal segments tinged with purple. Fore wing black-brown suffused with brilliant purple, slightly on terminal area, and irrorated with some whitish scales; subbasal line black defined by rufous, waved, from costa to submedian fold; antemedial line black defined on each side by rufous, waved; medial area with a rufous streak below costa; reniform rufous, its centre defined by black, white points at its upper and lower extremities and a rufous streak from it to postmedial line; a sinuous black medial line closely approximated below the cell to the postmedial line, which is black slightly defined on each side by rufous and at costa by ochreous white, oblique to vein 6, then sinuous, at vein 3 bent upwards to lower edge of reniform, some whitish points beyond it on costa; subterminal line ochreous white towards costa, then grey defined on each side by black suffusion, slightly angled inwards below costa and excurved below vein 7 and at middle; a series of black and ochreous white spots just before termen; a fine ochreous white line at base of cilia. Hind wing dark brown with some purple suffusion from origin of vein 2 to termen and along terminal half of vein 1; two sinuous black postmedial lines; subterminal line grey defined on each side by black suffusion, waved; a series of black and ochreous white striæ just before termen; a fine ochreous white line at base of cilia; the underside whitish tinged with brown except on inner area, a slight discoidal bar, two crenulate black postmedial lines, a dentate grey subterminal line defined on each side by fuscous, and a series of black lunules before termen defined on outer side by ochreous white.

Hab. SIERRA LEONE (*Dudgeon*), 1 ♂ type; ASHANTI, Obuasi (*Bergman*), 1 ♂; N.E. RHODESIA, Chambezi valley (*Neave*), 1 ♀. *Exp.* 40–44 mm.

ARGADESA MATERNA Linn. Syst. Nat. ed. xii. 2. p. 840 (1766).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa R., Bangweolo distr; PORTUGUESE E. AFRICA, S. Angoniland.

HALASTUS DIVITIOSA Wlk. Tr. N. H. Glasg. i. p. 356, pl. vii. f. 11 (1873).

CONGO, Lualaba R.; N.E. RHODESIA, Chambezi valley, Kalungwisi distr.

SPHINGOMORPHA CHLOREA Cram. Pap. Exot. ii. pl. 104. f. C. (1779).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr., Serenji distr., Kalungwisi valley, Bangweolo distr.; PORTUGUESE E. AFRICA, Chinde.

PANDESMA JUBRA Swinh. P. Z. S. 1889, p. 413, pl. 44. f. 4.

CONGO, Katanga, Kambove.

ERICEIA INANGULATA Guen. Noct. iii. p. 210 (1852).

N.W. RHODESIA, Kafue R.; N.E. RHODESIA, E. Luangwa distr., Luangwa R., Chinsali distr., Mansya R.; PORTUGUESE E. AFRICA, S. Angoniland.

POLYDESMA COLLUTRIX Geyer, Zütr. v. p. 22, ff. 885 6 (1837).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Fort Jameson.

HYPOCALA DEFLORATA Fabr. Ent. Syst. iii. p. 472 (1792).

CONGO, S.E. Katanga; N.E. RHODESIA, Serenji distr.; PORTUGUESE E. AFRICA, S. Angoniland.

CALPE EMARGINATA Fabr. Ent. Syst. iii. 2. p. 82 (1792).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

PLUSIODONTA COMMODA Wlk. xxxiii. 844 (1865).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley.

COSMOPHILA EROSA Hubn. Zutr. Samml. Exot. Schmett. ii. p. 19, ff. 287 8 (1827).

CONGO, Katanga, Kambove; N.W. RHODESIA, Kapopo; N.E. RHODESIA, E. Luangwa distr., Luangwa R., Chambezi valley, Chinsali distr., Bangweolo distr., Mansya R., Mpika.

COSMOPHILA SABULIFERA Guen. Noct. ii. p. 404 (1852).

N.W. RHODESIA, Kapopo; PORTUGUESE E. AFRICA, Chinde.

COSMOPHILA LUPERCA Möschl. Verh. zool.-bot. Ges. Wien, xxxiii. p. 300, pl. xvi. f. 15 (1883).

N.E. RHODESIA, E. Luangwa distr.

COSMOPHILA BIDENTATA, sp. n. (Pl. XXXVII. fig. 11.)

♂. Head and thorax bright rufous slightly mixed with greyish; abdomen grey slightly tinged with rufous; pectus, legs, and ventral surface of abdomen whitish. Fore wing ochreous greyish suffused with rufous, the terminal area deep rufous; a small grey patch at base of inner margin; antemedial line deep rufous, oblique, sinuous; orbicular a white point ringed with rufous; reniform rufous with slight white points at the angles of cell; postmedial line deep rufous, excurved below costa, then incurved and with some dark points on it, dentate at veins 4, 3, then bent inwards to origin of vein 2 and oblique to vein 1; subterminal line indistinct, pale, excurved below vein 7 and at middle; a fine yellowish line at base of cilia. Hind wing grey-brown, the cilia brownish at base, white at tips; the underside whitish, the costal half tinged with rufous, a curved punctiform postmedial line from costa to vein 3.

♀. Head, thorax, and fore wing deeper and more uniform rufous, the last with the ante- and postmedial lines defined by white.

Ab. 1. ♂ ♀. Head, thorax, and fore wing dark purplish brown.

Hab. N.W. RHODESIA, Alala plateau (*Neave*), 1 ♂, 3 ♀, Kapopo (*Neave*), 2 ♂, 1 ♀ type; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♂, 2 ♀, Luangwa valley (*Neave*), 1 ♂, 1 ♀, Kalungwisi distr. (*Neave*), 1 ♀, Bangweolo distr. (*Neave*), 5 ♀, Mansya R. (*Neave*), 7 ♂, 1 ♀, Mpika (*Neave*), 1 ♂; MASHONALAND, Salisbury (*Marshall*), 1 ♂. *Exp.* 36-40 mm.

COSMOPHILA RETRACTA, sp. n. (Pl. XXXVII. fig. 20.)

♂. Head and thorax red-brown; abdomen grey-brown; pectus, femora, and ventral surface of abdomen whitish. Fore wing silky red-brown with a greyish olive tinge and slight fuscous irroration; antemedial line indistinct, double, waved; a blackish point in middle of cell and two blackish and white discoidal points; postmedial line whitish, obliquely excurved from costa to vein 3, then retracted to before lower angle of cell and obliquely excurved to inner margin; an indistinct pale subterminal line with small obscure fuscous spots on its inner edges, excurved below vein 7 and at middle. Hind wing grey-brown, the terminal area rather darker; cilia with a fine white line at base and white tips; the underside white tinged and irrorated with brown, a brown postmedial line from costa to vein 5.

Hab. CONGO, Katanga, Kambove (*Neave*), 3 ♂ type; N.W. RHODESIA, Kapopo (*Neave*), 1 ♂. *Exp.* 36 mm.

MESOGENEA PERSINUOSA, sp. n. (Pl. XXXVII. fig. 10.)

♀. Head and thorax red-brown with a white streak on vertex; palpi white at base and tips; abdomen grey-brown; pectus, legs, and ventral surface of abdomen white slightly irrorated with brown, the last with blackish sublateral points on terminal segments. Fore wing red-brown sparsely striated with black; antemedial line white, slightly angled outwards below costa, then somewhat inwardly oblique; a black point in middle of cell; postmedial line white, very strongly bent outwards from below costa to vein 4, then retracted to origin of vein 2 and very oblique to inner margin; faint traces of a sinuous dark subterminal line; a fine whitish line at base of cilia. Hind wing greyish suffused with brown, the terminal area darker; a fine pale line at base of cilia which are white at tips; the underside with the costal area grey striated with black.

Ab. 1. Head, thorax, and fore wing brown tinged with grey, the head and thorax without the white streak; fore wing with the lines dark, the postmedial line faintly defined by grey on outer side and with patches of dark suffusion on it in its sinus and at inner margin, no white line at base of cilia.

♂. Head, thorax, and fore wing black-brown, the tegulæ in front and the edges of patagia sometimes white; the fore wing with the lines very indistinct, the point in cell edged with white above, some white irroration before subterminal line especially towards costa.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♂ type; N.E. RHODESIA, Petauke (*Neave*), 2 ♀; BR. C. AFRICA, Zomba (*Rendall*), 1 ♂; MASHONALAND, Salisbury (*Marshall, Dobbie*), 2 ♂. *Exp.* 24–28 mm.

RHYNCODES NIGRICILIATA, sp. n. (Pl. XXXVII. fig. 18.)

Palpi upturned, the 2nd joint reaching to above vertex of head and fringed with hair above at extremity, the 3rd porrect; antennæ of male minutely serrate and ciliated; fore wing with the termen strongly excised below apex and excurved at middle, then again excised.

Head, thorax, and abdomen yellow suffused with whitish; palpi, antennæ, and fore and mid legs in front rufous. Fore wing yellow suffused with whitish with a faint violaceous tinge, the costal edge rufous; a rufous medial line with blackish mark at costa, angled outwards below costa, then oblique; two blackish discoidal points; a straight rufous line with blackish mark at costa from costa before apex to tornus; two black points on costa towards apex, three on termen at the excision below apex, and three above tornus; the cilia rufous, black-tipped at the excisions. Hind wing yellow, with black points on termen between veins 7 and 3; the underside faintly tinged with rufous and with slight dark irroration, a black discoidal point and terminal series of points.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♂ type; N.E. RHODESIA, Kalungwisi valley (*Neave*), 1 ♀. *Exp.* ♂ 24, ♀ 34 mm.

PANTIDIA ANDERSONI Feld. Reis. Nov. pl. 115. f. 13 (1874).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Luangwa R.

PANTIDIA SCISSA Wlk. xxxiii. 851 (1865).

N.E. RHODESIA, Kalungwisi valley.

FODINA EMBOLOPHORA Hmpsn. Ann. S. Afr. Mus. ii. p. 364 (1902).

N.E. RHODESIA, E. Luangwa distr.

BANIANA HETEROSPILA, sp. n. (Pl. XXXVII. fig. 27.)

Antennæ of male bipectinate with moderate branches, the apical part ciliated, of female with short branches, mid tibiæ with fringe of long hair below.

Head, tegulæ, and front of thorax chocolate-brown, the rest of thorax and abdomen yellowish white irrorated with brown: antennæ brown. Fore wing yellow tinged with rufous and irrorated with dark brown; a small dark brown spot at base of costa; an oblique chocolate-brown antemedial mark from costa and clavate band from just above median nervure to inner margin forming a triangular mark in submedian interspace, these markings defined by whitish; orbicular and reniform black-brown defined by whitish, the former small, round, the latter an oblique lunule; postmedial line chocolate-brown defined by whitish, forming a wedge-shaped mark at costa, then slight, oblique to vein 3, then retracted to origin of vein 2 and sinuous to inner margin where it forms a spot; a conical black-brown patch on costa towards apex, defined by whitish and with two whitish points on costa, a somewhat lunulate chocolate-brown line just before termen; cilia rufous. Hind wing yellowish irrorated with red-brown: a slightly sinuous rufous terminal line; cilia rufous with a yellowish line at base; the underside yellow, the costal area irrorated with brown.

Hab. UGANDA, Entebbe (*Minchin*), 1 ♀; CONGO, Lualaba R. (*Neave*), 1 ♀; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♀, Luangwa valley (*Neave*), 1 ♂, 1 ♀, Chambezi valley (*Neave*), 2 ♂, 1 ♀ type. *Exp.* 34 mm.

BANIANA PYRAMIDALIS, sp. n. (Pl. XXXVII. fig. 28.)

♂. Head and tegulæ rufous; thorax and abdomen yellowish white with some rufous on prothorax and base of patagia. Fore wing yellow; the costal edge chocolate-brown at base; a triangular chocolate-brown mark in submedian interspace just before middle, its inner angle connected with a small triangular spot on inner margin, another small triangular spot on inner margin just beyond it; a conical chocolate-brown patch on costa towards apex with two yellowish points on costa. Hind wing pale yellow.

♀. Fore wing sparsely irrorated with dark brown; a dark brown point on costa near apex and a series of slight lunules just before termen.

Hab. N.E. RHODESIA, Luangwa valley (*Neave*), 1 ♂ type, Chambezi valley (*Neave*), 1 ♀. *Exp.* 36 mm.

BANIANA ANGULINA Mab. C. R. Ent. Soc. Belg. xxi. p. lxi (1881).

N.E. RHODESIA, Luangwa R., Chambezi valley.

BANIANA ASPILA, sp. n. (Pl. XXXVII. fig. 29.)

Antennæ of male bipectinate with moderate branches to near apex; mid tibiæ fringed with hair above, the hind tibiæ below.

♂. Head, thorax, and abdomen pale yellow faintly tinged with rufous, the back of head and tegulæ velvety black; fore and mid tibiæ in front black-brown. Fore wing yellow tinged with rufous and irrorated with black; an antemedial black point just below cell with traces of an oblique line from it to inner margin; a black point in middle of cell and slight discoidal lunule; postmedial line faint, yellowish with very incomplete series of black points and striæ on it, bent outwards below costa, at vein 3 retracted to just below angle of cell and slightly bent outwards to inner margin; faint trace of a subterminal dark shade incurved at discal fold; a series of black points just before termen. Hind wing ochreous white, the terminal area suffused with fuscous except at tornus: cilia ochreous white: the underside with the costal area slightly irrorated with brown, the terminal area with fuscous from apex to vein 2.

♀. Hind wing darker with dark discoidal lunule.

Hab. N.E. RHODESIA, E. Luangwa distr., Mterize R. (*Neave*), 1 ♂ type, Mbala country (*Neave*), 1 ♂, Chambezi valley, (*Neave*), 3 ♂, 1 ♀, Mansya R. (*Neave*), 1 ♂; BR. C. AFRICA, Zomba (*Johnston*), 2 ♂. *Exp.* 38 mm.

BANIANA DISJUNCTA Wlk. xxxiii. 999 (1865).

N.E. RHODESIA, Luangwa valley, Chambezi valley, Chinsali distr., Bangweolo distr.

BANIANA HAMIFERA Hmpsn. Ann. S. Afr. Mus. ii. p. 401 (1902).

N.E. RHODESIA, Luangwa distr.

BANIANA TRIGONOSPILA, sp. n. (Pl. XXXVII. fig. 19.)

Antennæ of male bipectinate with moderate branches, the apex ciliated; palpi with the 3rd joint long, with tuft of hair above at base.

♂. Head white, the palpi and antennæ brown; thorax and abdomen grey mixed with brown. Fore wing grey suffused and irrorated with brown, the subcostal area whitish to postmedial line; a slight subbasal dark mark on costa and two antemedial marks; a triangular black-brown patch on inner area from near base to before middle where it extends from cell to inner margin; a small clavate black mark in middle of cell and a **U**-shaped black mark filled in with white at lower angle, a dark mark above it on costa: postmedial line blackish defined on outer side by whitish and with dark mark at costa, slightly incurved below costa and incurved below vein 4; a whitish subterminal line excurved below vein 7 where there is a blackish mark on its inner side and excurved at middle, then incurved and obsolescent; an oblique blackish mark from apex; a terminal series of black striæ and whitish line at base of cilia. Hind wing grey-brown; the underside whitish irrorated with fuscous, the terminal area suffused with fuscous, a small black discoidal spot, traces of a curved medial line and indistinct crenulate postmedial line.

Hab. N.W. RHODESIA, Kapopo (*Neave*), 1 ♂; N.E. RHODESIA, upper Luangwa R. (*Neave*), 1 ♂ type. *Exp.* 28 mm.

BANIANA ATRIPLAGA Wlk. xv. 1795 (1858).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

BANIANA CULMINIFERA, sp. n. (Pl. XXXVII. fig. 30.)

Antennæ of male with serrations ending in a bristle, of female ciliated: fore and mid tibiæ with tuft of long hair below.

Head, thorax, and abdomen greyish ochreous mixed with fuscous, the vertex of head and tips of tegulæ blackish; palpi, pectus, and ventral surface of abdomen reddish ochreous, the palpi with darker band at extremity of 2nd joint. Fore wing greyish ochreous tinged with rufous and irrorated with brown to the postmedial line, the terminal area grey suffused with fuscous; subbasal line represented by a black striga from costa; antemedial line with black mark at costa, then red-brown, waved; a black striga from middle of costa defined on outer side by whitish; a black discoidal striga; postmedial line black slightly defined on outer side by rufous, arising below costa, incurved at discal fold, at vein 3 bent upwards to the discoidal striga, then sinuous to inner margin, some white points beyond it on costa; faint traces of a subterminal line, excurved below vein 7 and at middle; a terminal series of black points. Hind wing grey-brown, the terminal area suffused with fuscous; cilia grey at tips; the underside with terminal series of slight dark lunules.

Ab. 1. Fore wing with the pale area reddish ochreous without grey tinge, a black discoidal point not connected with the postmedial line.

Hab. N.W. RHODESIA, Alala plateau (*Neave*), 1 ♀; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 5 ♂, 4 ♀ type, Luangwa R. (*Neave*), 1 ♂. *Exp.* 28-30 mm.

PLECOPTERA TRIPALIS Wllgrn. Wien. Ent. Mon. vii. p. 149 (1863).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

PLECOPTERA MEGARTHRA, sp. n. (Pl. XXXVII. fig. 31.)

Antennæ of male serrate and fasciculate.

Mid tibiæ of male fringed with very long hair below, the 1st joint of tarsus dilated; tibiæ, coxæ, and base of abdomen below with tufts of hair.

♂. Head and thorax brown mixed with grey; legs with the tufts of hair ochreous white; abdomen grey with fuscous mixed. Fore wing purplish grey irrorated with brown, the terminal area suffused with chocolate-brown; antemedial line black defined on inner side by whitish, almost straight and erect; two black discoidal points connected by a whitish striga, with a black and whitish striga above it from costa; postmedial line black defined on inner side by whitish and on outer slightly by rufous, arising below costa, straight, oblique; some white points on postmedial part of costa; faint traces of a sinuous subterminal line; a terminal series of black points. Hind wing fuscous brown, the terminal area darker; a fine dark terminal line; cilia greyish at tips; the underside grey thickly irrorated with brown, the terminal area darker, a dark discoidal point and indistinct curved postmedial line.

Hab. N.E. RHODESIA, E. Luangwa distr., Mbala country (*Neave*), 1 ♂ type, Petauke (*Neave*), 1 ♂, Niamdazi R. (*Neave*), 1 ♂. *Exp.* 34 mm.

PLECOPTERA MELALEPIS, sp. n. (Pl. XXXVII. fig. 32.)

Mid tibiæ of male fringed with long hair below.

Head and tegulæ pale rufous; thorax purplish grey mixed with brown; mid tibiæ of male with the tufts of hair blackish; abdomen grey suffused with brown. Fore wing purple-grey, irrorated with large black and whitish scales except on costal and terminal areas; antemedial line slight, black defined on inner side by whitish, nearly straight and erect; two black discoidal points with a black striga defined on outer side by whitish above them from costa; postmedial line black defined on inner side by white, arising below costa, nearly straight and oblique; some white points on postmedial part of costa; subterminal line indistinct, grey, angled inwards at discal fold and outwards at middle, then incurved; a series of black points just before termen. Hind wing fuscous brown; a terminal series of blackish striæ: the underside whitish thickly irrorated with brown, the terminal area darker, a black discoidal point and indistinct curved postmedial line.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 4 ♂, 2 ♀ type, Luangwa R. (*Neave*), 1 ♀. *Exp.* 32 mm.

PLECOPTERA FLAVILINEA, sp. n. (Pl. XXXVII. fig. 33.)

Head and tegulæ yellow tinged with rufous; thorax purplish grey mixed with brown; pectus and legs whitish mixed with brown; abdomen grey suffused with brown. Fore wing purplish grey tinged with brown and irrorated with a few black scales, the postmedial area suffused with chocolate-brown; antemedial line rufous defined on inner side by yellow, slightly angled outwards below costa, then erect and somewhat sinuous; two black discoidal points on a red-brown bar, a red-brown bar above them from costa defined on outer side by whitish; postmedial line rufous defined on inner side by yellow, arising below costa, oblique, straight; some white points on postmedial part of costa; traces of a waved grey subterminal line; a terminal series of black points; cilia whitish at tips. Hind wing grey-brown, the terminal area tinged with fuscous; cilia whitish at tips; the underside whitish thickly irrorated with brown, the terminal area darker, a slight dark discoidal lunule and traces of a postmedial line.

Hab. S. NIGERIA, Lagos (*Boag*), 1 ♂; BR. C. AFRICA, Fwambo, 1 ♂; N.W. RHODESIA, Alala plateau (*Neave*), 2 ♂, 1 ♀ type; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♀, Bangweolo distr. (*Neave*), 3 ♂. *Exp.* 30–34 mm.

Plecoptera thermozona, sp. n. (Pl. XXXVII. fig. 34.)

Head, thorax, and abdomen pale grey mixed with brown. Fore wing pale grey tinged with rufous and slightly irrorated with black; antemedial line rufous defined on inner side by yellow, slightly angled outwards below costa, then erect and somewhat sinuous; two rufous discoidal points with a striga above them from costa; postmedial line dark brown with a narrow yellow band on inner side, its inner edge defined by a faint sinuous brown line, arising below costa, oblique, straight; the postmedial area chocolate-red with some white points on costa, its outer edge bent outwards to apex, at middle, and to tornus and incurved at discal fold and below vein 3, the slight grey subterminal line just before the edge and somewhat dentate at veins 7, 6, 4, 3; a series of black points just before termen. Hind wing pale grey-brown, the terminal area darker; the underside pale grey thickly irrorated with brown, a slight discoidal lunule and curved postmedial line.

Hab. N.E. Rhodesia, N. Luangwa, Mt. Ulungu (*Neave*), 1 ♀, E. Luangwa distr., Mterize R. (*Neave*), 1 ♂ type. *Exp.* 34 mm.

Plecoptera laniata, sp. n. (Pl. XXXVII. fig. 35.)

Antennæ of male minutely serrate with long bristles and cilia; mid and hind tibiæ fringed with long hair below; the ventral surface of abdomen with woolly hair on basal segment.

Head and thorax grey mixed with red-brown; abdomen grey suffused with fuscous brown, the hair on ventral surface of male ochreous white. Fore wing grey tinged with rufous and slightly irrorated with black; antemedial line red-brown defined on inner side by yellow, straight, erect; two brown discoidal points with a slight angled mark above them on costa defined on outer side by yellowish; postmedial line red-brown defined on both sides by yellowish and with slight blackish line beyond it arising just below costa, oblique, slightly bent outwards to inner margin; some white points on postmedial part of costa; subterminal line blackish, angled outwards at veins 4, 3, then incurved and ending at tornus; a series of black points just before termen. Hind wing grey-brown, the terminal area suffused with fuscous; the underside greyish suffused and irrorated with brown, a slight discoidal lunule and diffused sinuous postmedial line, the terminal area suffused with fuscous.

Ab. 1. Head, thorax, abdomen, and fore wing pale ochreous yellow, the last with the postmedial area tinged with brown; hind wing yellowish except the terminal area.

Hab. N.E. Rhodesia, E. Luangwa distr. (*Neave*), 1 ♂. 1 ♀ type, Luangwa R. (*Neave*), 4 ♂, 1 ♀; Transvaal, White R. (*Cooke*), 1 ♂. *Exp.* 34–40 mm.

Plecoptera infuscata, sp. n. (Pl. XXXVII. fig. 17.)

Antennæ of male minutely serrate with long bristles and cilia; mid femora from extremity and hind femora from base with tufts of long rufous hair.

♂. Head deep rufous, the basal joint of antennæ yellowish white in front; thorax and abdomen grey-brown. Fore wing grey tinged with rufous and suffused with fuscous brown, the postmedial area pale, the terminal area darker; traces of a dark antemedial line, excurved to below cell, then oblique; a white point at origin of vein 2; a diffused blackish discoidal lunule; postmedial line oblique from costa to vein 6, then hardly traceable, incurved below vein 4; subterminal line indistinct, dark with series of slight white points on it, excurved below vein 7 and at middle, then incurved and ending at tornus: a terminal series of slight dark striæ; cilia rufous. Hind wing pale reddish brown, the terminal area suffused with fuscous, narrowing to tornus: cilia rufous, fuscous towards apex. Underside of fore wing white tinged with brown except on postmedial area, the terminal area fuscous, the costa rufous irrorated with brown, the discoidal lunule blackish; hind wing whitish irrorated with brown, the terminal area fuscous, a dark discoidal spot and rather diffused postmedial line.

Hab. N.E. RHODESIA, E. Luangwa distr., Petauke (*Neave*), 1 ♂ type. *Exp.* 40 mm.

PLECOPTERA TRICHOPHORA, sp. n. (Pl. XXXVII. fig. 26.)

Antennæ of male with long bristles and cilia; fore femora and tibiæ below, mid tibiæ below and 1st joint of tarsus above and hind coxæ with tufts of long hair; fore wing with the inner area near base clothed with long woolly hair.

♂. Head and thorax grey-brown; palpi pale ochreous; fore and mid legs with the tufts of hair fuscous brown, hind coxæ with ochreous tufts; abdomen grey suffused with fuscous, the anal tuft tinged with rufous. Fore wing purplish grey irrorated with black, some black suffusion beyond postmedial line and on apical area, the woolly hair near base black-brown; two black discoidal points; postmedial line black slightly defined by rufous, strongly bent outwards and obsolescent below costa and slightly incurved below vein 4, some white points beyond it on costa; subterminal line blackish, dentate, angled outwards at vein 7 and excurved at middle; a terminal series of black points. Hind wing grey-brown suffused with fuscous; the underside suffused with fuscous brown, a black discoidal striga.

Hab. N.E. RHODESIA, Chambezi valley (*Neave*), 2 ♂, Lake Bangweolo (*Neave*), 1 ♂ type. *Exp.* 38 mm.

PLECOPTERA SARCISTIS, sp. n. (Pl. XXXVII. fig. 8.)

Legs of male normal.

♂. Head and tegulæ black-brown: palpi whitish in front; frons with white bar connecting lateral streaks; vertex of head creamy white; thorax ochreous tinged with rufous; pectus, legs, and abdomen ochreous tinged with brown. Fore wing ochreous strongly tinged with rufous; a black discoidal point; postmedial line black, arising below costa, oblique to discal fold, then faint and inwardly oblique to vein 2, where it joins an oblique black line from lower angle of cell and terminates; a series of slight blackish points just before termen; cilia fuscous brown. Hind wing pale glossy brown tinged with rufous, the cilia whitish except at base; the underside white tinged and irrorated with brown.

Hab. N.E. RHODESIA, Kalungwisi distr. (*Neave*), 2 ♂ type. *Exp.* 34 mm.

PLECOPTERA RESISTENS, Wlk. xv. 1749 (1858).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Kalungwisi valley.

PLECOPTERA PUNCTILINEATA, sp. n. (Pl. XXXVII. fig. 9.)

Head and tegulæ pale rufous; thorax and abdomen grey-brown; pectus, legs, and ventral surface of abdomen white. Fore wing red-brown very slightly irrorated with black; obliquely placed subbasal black points below costa and cell; antemedial line with black striga from costa, then red-brown, sinuous; reniform rufous or black with slight white annulus; postmedial line with black striga from costa, then red-brown with series of black points on it, slightly bent outwards below costa, incurved at discal fold and below vein 4, some white points beyond it on costa; subterminal line with series of black and white points on it, forming two small spots below costa, angled outwards at vein 7 and excurved at middle; a series of black points just before termen. Hind wing pale reddish brown, the terminal area suffused with fuscous; the underside whitish irrorated with brown, the terminal area suffused with fuscous, a dark discoidal point and indistinct sinuous postmedial line.

Hab. W. AFRICA, Oil Rivers, 1 ♀; BR. E. AFRICA (*Gregory*), 1 ♀, Takaunga (*Thomas*), 1 ♀; UGANDA (*Christy*), 1 ♂; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 4 ♂, 9 ♀ type, Luangwa valley (*Neave*), 1 ♂, Chambezi valley (*Neave*), 1 ♂, Mpika (*Neave*), 1 ♂; MASHONALAND, Salisbury (*Marshall*), 1 ♂, 3 ♀; GAZALAND, Chirinda forest (*Marshall*), 1 ♂, 1 ♀. *Exp.* 30–34 mm.

PLECOPTERA GRISEA, sp. n. (Pl. XXXVIII. fig. 1.)

Antennæ of male minutely ciliated.

Fore femora and tibiæ of male below and mid tibiæ above fringed with long hair.

♂. Head, thorax, and abdomen grey slightly tinged with brown; palpi, frons, antennæ, and the fringes of hair on legs fuscous black. Fore wing grey irrorated with brown; antemedial line very indistinct, dark, waved; a black point in middle of cell; reniform tinged with rufous and faintly defined by blackish; postmedial line indistinct, dark, minutely waved, incurved below vein 4, some whitish points beyond it on costa; subterminal line whitish defined on inner side by red-brown suffusion and a blackish spot in submedian interspace, waved, slightly excurved below vein 7 and at middle; a series of black points before termen and a fine waved black terminal line. Hind wing grey irrorated with brown; traces of a dark medial line and of a minutely waved subterminal line; a series of black points just before termen, a fine black terminal line and white line at base of cilia. Underside of fore wing and costal area of hind wing suffused with black-brown, the rest of hind wing whitish striated with fuscous.

Hab. N.E. RHODESIA, Kalungwisi valley (*Neave*), 1 ♂ type. *Exp.* 36 mm.

PLECOPTERA RUFIRENA Hmpsn. Ann. S. Afr. Mus. ii. p. 367 (1902).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Chambezi valley, Fort Jameson; PORTUGUESE E. AFRICA, S. Angoniland.

PLECOPTERA FLAVICEPS Hmpsn. Ann. S. Afr. Mus. ii. p. 403 (1902).

N.W. RHODESIA, Alala plateau: N.E. RHODESIA, Serenji distr., Luangwa distr., Chinsali distr., Chambezi valley.

GNAMPTOGYIA DIAGONALIS, sp. n. (Pl. XXXVIII. fig. 2.)

Head and thorax pale yellow pencilled with red-brown; abdomen pale yellow dorsally tinged with rufous and with slight white and fuscous segmental lines; palpi in front, pectus, legs, and ventral surface of abdomen yellowish white, the fore and mid tibiæ streaked with rufous. Fore wing yellowish white, the terminal area greyish rufous; a double very oblique rufous line from costa before middle to inner margin near base; a black point in end of cell; three very oblique white lines defined on each side by rufous from below costa beyond middle to middle of inner margin; a double very oblique rufous line from below apex to inner margin beyond middle: an indistinct double obliquely curved rufous subterminal line with a series of black points beyond it; cilia white at base followed by a dark line, brown at middle and white at tips, with a dark line through them. Hind wing pale yellow with some rufous striæ above medial part of vein 1; two rufous subterminal lines indistinctly double towards inner margin, with some black suffusion beyond them towards apex and some black points towards tornus; cilia white at base followed by a dark line, brown at middle and white at tips, with a dark line through them; the underside pale yellow sparsely irrorated with brown scales, a series of black points before termen from apex to vein 2.

Ab. 1. Head, thorax, and fore wing grey suffused with brown and without yellow tinge; abdomen grey suffused with fuscous; hind wing grey tinged with brown and with three double medial lines extending to below costa, the terminal area suffused with [illegible] except towards tornus.

Hab. BR. E. AFRICA, Taveta (*Rogers*), 1 ♂, Tana R. (*Crawshay*), 1 ♀; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 3 ♂, Luangwa valley (*Neave*), 1 ♂ type. *Exp.* 20–28 mm.

ANTARCHÆA SUBFLAVALIS Wlk. xxxiii. 1205 (1865).

N.E. RHODESIA, Chambezi valley.

ANTARCHÆA FRAGILIS Butl. A. M. N. H. (4) xvi. p. 413 (1875).

N.E. RHODESIA, upper Luangwa valley, Chambezi valley.

ANTARCHÆA DUPLICALIS Wlk. xxxiii. 1205 (1865).

N.E. RHODESIA, E. Luangwa distr.

ANTARCHÆA HÆMACEPS, sp. n. (Pl. XXXVIII. fig. 10.)

Head and tegulæ blood-red mixed with some black: thorax and abdomen ochreous tinged with blood-red; legs blood-red, the tarsi fuscous. Fore wing olive-ochreous tinged with blood-red, the terminal area tinged with brown except at apex and tornus; a blackish point in base of cell, a subbasal blackish striga below costa and point in cell; obliquely placed antemedial reddish points below costa and in and below cell; reniform faintly defined by blood-red, with reddish point in upper part and blackish point in lower, an incurved reddish line from just beyond it to inner margin where there is a blackish point; postmedial line reddish, slightly bent outwards below costa, then minutely waved, slightly angled inwards at discal fold and incurved below vein 4; subterminal line brownish, slightly excurved below vein 7 and at middle, the veins beyond it with faint pale streaks with black points on them before termen; cilia blood-red with a fine dark line near tips. Hind wing yellowish tinged with blood-red, the area from end of cell to just before termen suffused with fuscous, leaving the termen blood-red with a series of black points just before it; cilia blood-red; the underside whitish thickly irrorated and suffused with blood-red except the inner area, a series of black points before termen.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 2 ♂ type, Luangwa R. (*Neave*), 1 ♂; NATAL, Durban (*Leigh*), 1 ♀. *Exp.* 30 mm.

ANTARCHÆA OLIVESCENS, sp. n. (Pl. XXXVIII. fig. 13.)

♂. Head blood-red mixed with black-brown; thorax and abdomen olive-ochreous faintly tinged with red; fore and mid tibiæ strongly tinged with red, the tarsi fuscous with pale rings. Fore wing olive-ochreous faintly tinged with red and sparsely irrorated with brown; an antemedial brown point below the cell; two black discoidal points; a faint reddish medial line, oblique from costa to beyond lower angle of cell, then inwardly oblique; faint traces of a double postmedial line with slight brown spots on it at discal and submedian folds, excurved from below costa to vein 4, then incurved; a series of small black-brown subterminal spots from costa to vein 4 and a series of points just before termen with slight striæ beyond them; cilia reddish with a black-brown line near tips. Hind wing yellow, the inner half faintly tinged with red and sparsely irrorated with black; some fuscous suffusion at apex; a series of black points just before termen and fine waved terminal line; cilia reddish with brown line near tips; the underside yellow sparsely irrorated with black except on inner area, the apex tinged with crimson, a black discoidal striga.

♀. Wings not tinged with red.

Hab. N.E. RHODESIA, Luangwa valley, Petauke (*Neave*), 1 ♂ type, N. Luangwa, Mt. Ulungu (*Neave*), 1 ♀. *Exp.* 30 mm.

ANTARCHÆA LENTISTRIATA, sp. n. (Pl. XXXVIII. fig. 20.)

♂. Head, thorax, and abdomen ochreous yellow, the head tinged with red, the antennæ blackish; fore and mid tibiæ red. Fore wing ochreous yellow finely striated with pale red-brown and irrorated with a few black scales; traces of a brownish antemedial line, oblique from costa to middle of cell, then sinuous; a minute black point at lower angle of cell; postmedial line faint, brownish, excurved below costa and incurved at discal fold and below vein 4; subterminal line represented by faint dark points from below costa to vein 5; a series of blackish points just before termen. Hind wing ochreous yellow finely striated with pale red-brown except on basal and costal areas, and irrorated with a few black scales; faint traces of a sinuous postmedial line; a series of blackish points just before termen and a terminal series of slight striæ; the underside pale yellow slightly irrorated with brown except on inner area.

Hab. N.E. RHODESIA, E. Luangwa distr., Mterize R. (*Neave*), 1 ♂ type. *Exp.* 32 mm.

ANTARCHÆA UMBRIFERA, sp. n. (Pl. XXXVIII. fig. 3.)

♂. Head, thorax, and abdomen black-brown mixed with grey; tarsi ringed with white. Fore wing whitish tinged with red-brown and thickly striated with dark brown, the postmedial area paler; traces of a curved blackish subbasal line; antemedial line rather diffused, blackish, sinuous, interrupted; a black point defined by whitish at lower angle of cell; an indistinct sinuous medial dark shade; postmedial line rather diffused, dark, double from costa to vein 4, excurved below costa and at middle; traces of a subterminal dark line with a series of blackish points on it, slightly excurved at vein 7 and middle; a series of black points just before termen. Hind wing whitish tinged with red-brown and striated with brown; an indistinct double postmedial line on inner area, traces of a sinuous subterminal line and a series of black points just before termen; the underside white faintly tinged with brown and irrorated with fuscous, a blackish discoidal point, traces of a postmedial line excurved beyond the cell and three black points before termen towards apex.

Hab. N.E. RHODESIA, Chambezi valley (*Neave*), 1 ♂ type. *Exp.* 32 mm.

Antarchæa hæmatoessa, sp. n. (Pl. XXXVIII. fig. 23.)

♀. Head, thorax, and abdomen ochreous suffused with blood-red. Fore wing ochreous suffused with blood-red; a small subbasal red spot in cell; antemedial small red spots below costa and in cell and blackish striæ below the cell and above inner margin; a small red spot in middle of cell; a figure-of-eight-shaped ochreous discoidal mark, defined by red and with black points in upper and lower parts; postmedial line double, the outer line formed of small lunulate spots defined on outer side by ochreous, excurved below costa, then oblique; subterminal line formed of red striæ defined on inner side by ochreous, slightly excurved below costa and minutely waved from vein 5 to inner margin; a series of red points well before termen; cilia with a fine crimson line at middle and whitish tips. Hind wing ochreous suffused with blood-red; a terminal series of red striæ: cilia white at tips; the underside suffused and irrorated with blood-red, two indistinct postmedial lines.

Hab. N.W. Rhodesia, Alala plateau, Mkushi distr. (*Neave*), 1 ♀ type. *Exp.* 26 mm.

Raparna tritonias Hmpsn. Ann. S. Afr. Mus. ii. p. 395 (1902).

N.E. Rhodesia, Tanganyika plateau, Kalungwisi distr., Bangweolo distr.

Acantholipes notata Hmpsn. Ill. Het. B. M. viii. p. 84, pl. 146. f. 3 (1891).

N.E. Rhodesia, N. Luangwa, Mt. Ulungu.

Acantholipes miser Butl. P. Z. S. 1883, p. 166.

N.E. Rhodesia, E. Luangwa distr.

Acantholipes trifasciata Moore, P. Z. S. 1877, p. 612.

Congo, Katanga, Kambove, Lualaba R.

Acantholipes ochrota Hmpsn. Trans. Zool. Soc. xix. p. 113, pl. iv. f. 23 (1909).

N.E. Rhodesia, Bangweolo distr.

Pleurona trogopera, sp. n. (Pl. XXXVIII. fig. 4.)

Fore wing with the termen excised below apex and angled at vein 5, a minute hyaline groove just beyond the discocellulars.

♂. Head, thorax, and abdomen grey suffused with reddish brown and irrorated with fuscous, the last with sublateral series of black points. Fore wing grey suffused with brown and thickly irrorated with black; antemedial line rather diffused, black, angled outwards below costa, then very oblique; medial line black, stronger at costa, angled outwards beyond the slight black discoidal striga, then very oblique; postmedial line double, black at costa, then slight, oblique to vein 4, then inwardly oblique and waved; subterminal line slight, dark, minutely waved and somewhat angled outwards above and below vein 4; a series of minute black points just before termen; a fine black terminal line; cilia black-brown. Hind wing grey suffused with brown and thickly irrorated with black; an oblique black antemedial line not reaching costa; indistinct double waved medial and subterminal lines, the latter with a series of black points on its inner edge; a series of minute black points just before termen and a fine black terminal line; cilia black-brown; the underside whitish tinged with brown and irrorated with black, the antemedial and medial lines as above, a subterminal series of black points.

Hab. N.E. RHODESIA, Chinsali distr. (*Neave*), 1 ♂ type. *Exp.* 28 mm.

DIOMŒA TENEBROSA Holl. Psyche, vii. p. 90, pl. iii. f. 17 (1894).

N.E. RHODESIA, E. Luangwa distr.

THERMESIA IRRORATA Fabr. Spec. Ins. ii. p. 506 (1781).

N.E. RHODESIA, E. Luangwa distr., upper Luangwa valley, Chambezi valley, Bangweolo distr., Mansya R., Mpika.

PARATHERMES LOPHOCERA, sp. n. (Pl. XXXVIII. fig. 6.)

Antennæ of male with large tuft of hair at one-third from base. Head, thorax, and abdomen grey-brown; palpi with the extremity of 2nd joint blackish, the 3rd joint blackish, white at base and tips; mid and hind tarsi whitish; abdomen with slight whitish segmental lines. Fore wing grey brown; subbasal line represented by a black and white point on costa, then by slight points; antemedial line black defined on each side by white at costa, excurved below costa, then slight, oblique. sinuous, interrupted; a slight dark discoidal spot; postmedial line blackish, defined on each side by white at costa, then slightly by grey on outer side, excurved below costa, then oblique and minutely waved, some small triangular pure white marks beyond it on costa with blackish streaks between them; a faint dark subterminal shade; a terminal series of black and white striæ. Hind wing grey-brown; a slight dark discoidal bar; postmedial line black-brown faintly defined on outer side by grey, slightly sinuous; a fine black-brown terminal line defined on inner side by a fine white line; the underside with blackish discoidal spot and curved minutely waved postmedial line.

Hab. CONGO, Lualaba R. (*Neave*), 1 ♂; N.E. RHODESIA, Chambezi valley (*Neave*), 11 ♂, 24 ♀ type. *Exp.* 24 28 mm.

PARATHERMES MARCHALI Boisd. Faun. Ent. Madag. & Maur., Lép. p. 105, pl. 13. f. 4 (1834).

CONGO, Lualaba R.; N.W. RHODESIA, Alala plateau, Kapopo; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Mt. Ulungu, Chambezi valley, Kalungwisi valley, Lake Bangweolo, Fort Jameson, Tanganyika plateau.

PARATHERMES ATRIPUNCTATA, sp. n. (Pl. XXXVIII. fig. 7.)

Head and thorax rufous irrorated with fuscous; palpi whitish irrorated with fuscous and with red band near extremity of 3rd joint; antennæ blackish; tegulæ grey at base; pectus and legs white irrorated with brown, the tibiæ rufous, the tarsi black ringed with white; abdomen grey-brown, the base tinged with rufous, the anal tuft rufous, the ventral surface white irrorated with brown. Fore wing grey-brown more or less strongly suffused with rufous and sparsely irrorated with black; subbasal line double, red with black point at costa, inwardly oblique and ending at submedian fold; antemedial line red, inwardly oblique and minutely waved, with black point at costa and sometimes two others in cell; a slight brown discoidal lunule; medial line indistinct, dark, bent outwards below costa, angled inwards at discal fold, incurved below vein 4 and with black point on it at submedian fold, closely approximated to the postmedial line, which is red with black point at costa, defined on outer side by ochreous, bent outwards below costa, slightly incurved at discal fold, incurved below vein 4; subterminal line ochreous, defined on inner side by black spots between veins 7 and 4 and on outer by blackish points and striæ, incurved to vein 4 where it is angled outwards, then again incurved, some dark and pale points before it on costa; a series of small black spots just before termen and a terminal series of striæ; cilia with blackish spots near base and black line defined on inner side by ochreous near tips. Hind wing grey-brown more or less suffused with rufous and irrorated with black, the costal area suffused with fuscous; a red postmedial line defined on outer side by yellow and with two black points before it on inner area only; a slight pale subterminal line from vein 4 to tornus; a series of black points just before termen; cilia rufous with yellow lines at base and near tips; the underside grey tinged with rufous and thickly irrorated with fuscous, the terminal area suffused with fuscous, a blackish postmedial line.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♀, Kalungwisi distr. (*Neave*), 1 ♂ type, Bangweolo distr. (*Neave*), 1 ♂, 1 ♀, Mansya R. (*Neave*), 1 ♂. *Exp.* 26 mm.

MECODINA SUBJECTA Wlk. xxxiii. 1012 (1865).

CONGO, Katanga, Kambove; N.E. RHODESIA, Chambezi valley.

GRACILLODES CAFFRA Guen. Noct. iii. p. 370 (1852).

CONGO, Lualaba R.; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, N. Luangwa, Mt. Ulungu, Feira, Kalungwisi valley.

EGNASIA VICARIA Wlk. xxxv. 1972 (1866).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley.

ZETHES CŒNOTYPE, sp. n. (Pl. XXXVIII. fig. 8.)

♂. Head, thorax, and abdomen grey mixed with brown, the tibial spurs and tarsi brown ringed with white, the anal tuft whitish. Fore wing grey suffused and irrorated with reddish brown and dark brown; antemedial line indistinct, dark, oblique from costa to median nervure, then inwardly oblique and slightly sinuous; orbicular and reniform white defined by brown, the former small, round, the latter rather bar-shaped; a diffused black medial line, oblique from costa to reniform, then inwardly oblique; postmedial line black slightly defined on outer side by grey, excurved from below costa to vein 4, then oblique; some slight pale points beyond it on costa; subterminal line whitish defined on inner side by fuscous suffusion, minutely dentate; a fine black terminal line. Hind wing grey suffused and irrorated with reddish brown and dark brown; a double diffused black medial line, slightly sinuous postmedial line, indistinct double subterminal line with series of black points beyond it, and fine black terminal line; the underside paler with more blackish irroration, a black and greyish discoidal spot, the lines as above but with no points beyond the subterminal line.

Hab. N E. RHODESIA, Chinsali distr. (*Neave*). 1 ♂ type. *Exp.* 28 mm.

HYPENINÆ.

NODARIA PLANA Swinh. Trans. Ent. Soc. 1890, p. 261.

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

NODARIA EXTERNALIS Guen. Delt. & Pyr. p. 64 (1852).

N.E. RHODESIA, Luangwa valley, Chambezi valley.

NODARIA NODOSALIS Herr.-Schäff. Eur. Schmett. ii. p. 385, Noct. f. 605 (1845).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley; PORTUGUESE E. AFRICA, Chinde.

NODARIA EXTINCTALIS Zell. Vet. Acad. Handl. 1852, p. 13 (1854).

N.E. RHODESIA, Kalungwisi distr.

SIMPLICIA PACHYCERA, sp. n. (Pl. XXXVIII. fig. 9.)

Antennæ of male thickened and fringed with hair at about one-third length; fore tibiæ with sheath enclosing a fringe of hair.

Head and thorax grey-brown tinged with rufous; antennæ with the shaft whitish towards base; legs fuscous; abdomen grey-brown, the anal tuft whitish. Fore wing grey-brown tinged with rufous; faint oblique subbasal and antemedial dark striæ and a slight discoidal lunule; the terminal area brownish white from below apex to tornus where it narrows to a point; a terminal series of brown striæ; cilia brownish white. Hind wing grey-brown; an indistinct diffused subterminal dark line angled outwards to termen at vein 2; cilia pale; the underside white tinged and irrorated with brown, a brown discoidal point and indistinct curved postmedial and subterminal lines.

Hab. W. AFRICA (*Dudgeon*), 1 ♂, 2 ♀ type; N.E. RHODESIA, Kalungwisi distr. (*Neave*), 1 ♂. *Exp.* 34-36 mm.

DEINHYPENA LACISTA Holl. Psyche, vii. p. 124, pl. ii. fig. 3 (1894).

CONGO, Katanga, Kambove.

DEINHYPENA APICATA, sp. n. (Pl. XXXVIII. fig. 35.)

♀. (Palpi broken). Head, thorax, and abdomen grey-brown. Fore wing black-brown, the costal area paler; a small white spot at lower angle of cell followed by a point; postmedial line brown placed on a grey band, bent outwards below costa, then oblique; a large quadrate creamy white apical patch extending to below vein 5, with an oblique black bar on it from apex and some blackish spots on termen; cilia chequered black and whitish. Hind wing fuscous brown with a slight pale subterminal line from vein 3 to inner margin; cilia chequered fuscous and whitish; the underside whitish irrorated and suffused with brown and with indistinct curved medial and postmedial lines.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀ type. *Exp.* 52 mm.

DICHROMIA LEUCOZONA, sp. n. (Pl. XXXVIII. fig. 27.)

♀. Head, thorax, and abdomen grey-brown. Fore wing brown with a leaden grey gloss; a black spot in middle of cell; a white postmedial band defined on outer side by black spots except on costal area, its inner edge oblique and slightly sinuous, its outer oblique to vein 3 and slightly dentate at veins 8, 6, below vein 3 erect and somewhat dentate. Hind wing grey-brown.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀ type. *Exp.* 40 mm.

HYPENA STRIGATA Fabr. Suppl. Ent. Syst. p. 467 (1798).

N.E. RHODESIA, E. Luangwa distr., Chambezi valley.

HYPENA JUSSALIS Wlk. xvi. 52 (1858).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley, Mpika.

HYPENA VERTICALIS, sp. n. (Pl. XXXVIII. fig. 28.)

♂. Head, thorax, and abdomen dark brown tinged with grey; palpi white at extreme tips; tarsi ringed with white. Fore wing dark brown tinged with purplish grey; antemedial line indistinct, dark, waved, oblique from costa to above vein 1; a small black spot in middle of cell and slight discoidal lunule; postmedial line black-brown slightly defined on outer side by ochreous grey, minutely waved, oblique from costa to vein 6, then erect, some whitish points beyond it on costa; a subterminal series of small black and grey spots in the interspaces, excurved at middle; a terminal series of small black lunules slightly defined on inner side by greyish; two fine waved black lines at base of cilia. Hind wing fuscous brown with terminal series of slight black striæ; two fine black lines at base of cilia which are greyish at tips; the underside tinged with grey.

♀. Fore wing with band of grey-white suffusion beyond the postmedial line defined on outer side by a sinuous black line, an oblique dentate black shade from termen below apex.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♂, 1 ♀ type, N. Luangwa, Mt. Ulungu (*Neave*), 1 ♂, Chambezi valley (*Neave*), 1 ♀, Tanganyika plateau (*Neave*), 1 ♂. *Exp.* 26–30 mm.

HYPENA TETRASTICTA, sp. n. (Pl. XXXVIII. fig. 29.)

♀. Head, thorax, and abdomen grey mixed with reddish brown; tarsi ringed with whitish. Fore wing grey mostly suffused with reddish brown and irrorated with black: two minute black subbasal points below the cell; antemedial line pale defined on outer side by black marks, slightly angled outwards below costa, then oblique to above vein 1 where it is angled outwards; a minute black point in middle of cell and slight discoidal lunule; postmedial line dark brown defined on outer side by ochreous, then by grey suffusion, oblique and almost straight, some black suffusion before it between lower angle of cell and vein 1, the grey beyond it defined by a faint sinuous fuscous line; subterminal line represented by an incurved series of four small dentate black and white marks from below costa to vein 5, then by a faint pale waved line; a grey-white apical patch defined below by an oblique black shade from apex with two dentate marks below it; a terminal series of slight black lunules and two fine lines at base of cilia. Hind wing reddish brown with a dark terminal line; cilia greyish with two fine dark lines at base; the underside reddish brown irrorated with grey.

Ab. 1. Fore wing with the point in cell black and white, a black spot beyond the cell on inner side of postmedial line, the black patch below the cell wedge-shaped and extending to the antemedial line.

Hab. N.E. RHODESIA, N. Luangwa, Mt. Ulungu (*Neave*), 2 ♀ type. *Exp.* 30 mm.

HYPENA SENIALIS Guen. Delt. & Pyr. p. 30 (1854).

N.E. RHODESIA, Luangwa valley.

HYPENA VARIALIS Wlk. xxxiv. 1132 (1865).

N.E. RHODESIA, Luangwa valley.

HYPENA RECURVATA Hmpsn. Trans. Zool. Soc. xix. p. 116, pl. iv. f. 27 (1909).

N.E. RHODESIA, E. Luangwa distr.

HYPENA ECTOGLAUCA Hmpsn. Ann. S. Afr. Mus. ii. p. 432 (1902).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, E. Luangwa distr., Chambezi valley, Kalungwisi valley, Lake Bangweolo, Tanganyika plateau, Mansya R.

HYPENA MASURIALIS Guen. Delt. & Pyr. p. 38 (1854).

N.W. RHODESIA, Kapopo; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Mt. Ulungu, Mansya R.; PORTUGUESE E. AFRICA, Chinde.

HYPENA LIVIDALIS Hübn. Samml. Eur. Schmett., Pyr. ff. 11, 186 (1827).

N.E. RHODESIA, Serenji distr.

HYPENA CONSCITALIS Wlk. xxxiv. 1509 (1865).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Chambezi valley, Kalungwisi valley.

RHYNCHINA REVOLUTALIS Zell. Vet. Acad. Handl. 1852, p. 10.

N.E. RHODESIA, E. Luangwa distr.

RHYNCHINA CRASSISQUAMATA, sp. n. (Pl. XXXVIII. fig. 33.)

♀. Head, thorax, and abdomen grey suffused with red-brown; tarsi with slight pale rings. Fore wing grey suffused with cupreous red-brown and slightly irrorated with black; antemedial line indistinct, rufous, sinuous: a tuft of raised black and grey scales in middle of cell, and another on discocellulars; postmedial line rufous, angled outwards below costa, then very oblique and defined on inner side by ochreous grey, defined on outer side by tufts of raised black and grey scales and met at lower angle of cell by a very oblique grey streak from apex; subterminal line represented by a series of tufts of raised rufous and grey scales, angled outwards below costa, then oblique and slightly excurved at middle; cilia red-brown, greyish at base and white at tips. Hind wing grey-brown with a cupreous tinge; cilia fuscous brown, grey at tips; the underside whitish tinged with rufous and irrorated with dark brown.

Hab. N.E. RHODESIA, Kalungwisi valley (*Neave*), 1 ♀ type. *Exp.* 28 mm.

RHYNCHINA LEUCODONTA, sp. n. (Pl. XXXVIII. fig. 34.)

♂. Head, thorax, and abdomen cupreous red-brown, the last with slight pale segmental lines; palpi white below; pectus, legs, and ventral surface of abdomen whitish. Fore wing cupreous red sparsely irrorated with black; antemedial line white, very oblique from costa near base to above vein 1 near postmedial line, then acutely angled inwards on vein 1; a white streak from antemedial line along terminal part of median nervure, obliquely bent upwards on discocellulars; a minute black point in middle of cell; the area between these white markings and an oblique white fascia from costa towards apex to middle of inner margin pale greyish fawn-colour; postmedial line represented by a slight oblique black line from costa to the white fascia, then by an obliquely curved series of slight tufts of raised black scales beyond the white fascia; some white points on postmedial part of costa; slight subterminal black points below veins 8, 7, and 4 and towards inner margin; cilia grey-brown with a white line at base. Hind wing pale cupreous brown, the cilia grey tinged with brown; the underside whitish tinged with cupreous red, a fine dark terminal line.

Hab. N.W. RHODESIA, Alala plateau, Mkushi distr. (*Neave*), 1 ♂ type. *Exp.* 26 mm.

NAARDA XANTHONEPHRA, sp. n. (Pl. XXXVIII. fig. 32.)

♀. Head, thorax, and abdomen dark brown irrorated with leaden silvery scales. Fore wing dark brown suffused with leaden silvery scales; antemedial line indistinct, dark, somewhat inwardly oblique and slightly sinuous; an indistinct diffused dark medial line; reniform yellow, narrow, elliptical; postmedial line dark, somewhat diffused and almost evenly curved; a minutely dentate grey-white subterminal line; a terminal series of blackish points. Hind wing brown with a purplish grey gloss; indistinct rather diffused dark medial and postmedial lines, a greyish subterminal line faintly defined on inner side by brown, and a fine blackish terminal line; the underside greyer, a faint dark discoidal striga, rather diffused postmedial line and sinuous grey subterminal line.

Hab. N.E. RHODESIA, upper Luangwa valley (*Neave*), 1 ♀ type. *Exp.* 16 mm.

MACULABA MŒSTALIS Wlk. xxxiv. 1126 (1865).

N.E. RHODESIA, upper Luangwa distr.

RHÆSENA SUBCUPRALIS Wlk. xxxiv. 1167 (1865).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

HYBLÆINÆ.

HYBLÆA FLAVIPICTA, sp. n. (Pl. XXXVIII. fig. 19.)

Head and thorax olive fuscous mixed with some grey; palpi below, pectus and legs yellow, the mid tarsi above and hind tibiæ and tarsi suffused with scarlet; abdomen blackish with scarlet segmental lines, the anal tuft scarlet, black at tip, the ventral surface scarlet. Fore wing blackish suffused with leaden grey, the costal edge rufous; obliquely placed rounded pale yellow antemedial patches below costa and cell; a small patch of pale yellow scales above middle of inner margin; a large more or less prominent pale yellow patch striated with fuscous from costa beyond middle to just above tornus, its outer edge obliquely rounded; a minute pale yellow streak on costa just before apex and a patch on cilia below apex. Hind wing with the basal area black-brown with a yellowish streak above vein 1, its outer edge inwardly oblique and irregular to vein 2, then angled outwards to above tornus leaving the inner margin scarlet; the rest of wing yellow becoming deep scarlet before and beyond the black subterminal band which is excurved to vein 3, then bent inwards and oblique to above tornus. Underside of fore wing yellow with scarlet suffusion on costa, a black streak in submedian fold, a black discoidal patch, its inner edge indented at lower angle of cell, its lower extremity connected by a fascia with the curved black subterminal band arising below costa and ending at vein 1; hind wing scarlet with some yellow at base, in submedian interspace and below lower angle of cell, subterminal black patches between vein 3 and submedian fold and below vein 1, and some minute points on apical area.

Hab. Congo, Katanga, Kambove (*Neave*), 4 ♂ type: N.E. Rhodesia, E. Luangwa distr. (*Neave*), 1 ♂, 2 ♀; Br. C. Africa, Zomba (*Manning*), 1 ♂. *Exp.* 26-34 mm.

Hyblæa flavifasciata, sp. n. (Pl. XXXVIII. fig. 16.)

♂. Head and thorax olive-fuscous tinged with grey; palpi white below at base; pectus and legs yellow, the tufts at extremity of hind tibiæ tinged with scarlet, the tarsi brownish with pale rings; abdomen black-brown with yellow segmental lines, the ventral surface yellow tinged with scarlet. Fore wing black-brown suffused with olive-grey and some ochreous; faint traces of a sinuous antemedial line; a very ill-defined ochreous grey postmedial band with the faint dark postmedial line on it, obliquely excurved from costa to vein 3, then incurved. Hind wing orange-yellow, the basal area black-brown, with irregularly sinuous outer edge angled outwards below vein 2 to above tornus; a black-brown band, terminal from apex to vein 2, then incurved and leaving a yellow patch on termen; cilia yellow, faintly tinged with scarlet from apex to vein 2. Underside of fore wing orange-yellow, the costa and termen tinged with scarlet, medial black points below costa and in cell, a black discoidal patch, its lower extremity connected by a fascia with the broad curved black subterminal band arising below costa; hind wing yellow, the costal area except at base and the terminal area tinged with scarlet, a black discoidal point, two below angle of cell, two in subterminal fold, the outer half of costal area and the terminal area with numerous points and with subterminal patch below vein 2 and terminal patch in submedian interspace.

♀. Head, thorax, and abdomen paler grey-brown; fore wing ochreous irrorated and in parts tinged with greyish fuscous, an oblique antemedial striga from discal fold to vein 1, a patch on costa above end of cell and oblique shade from lower angle of cell to inner margin, an oblique streak across apical area; hind wing with the postmedial yellow band narrower, the subterminal black band more incurved at submedian fold.

Hab. N.E. RHODESIA, Chambezi valley (*Neave*), 1 ♂ type, Feira (*Neave*), 1 ♀. *Exp.* ♂ 30, ♀ 32 mm.

HYBLÆA XANTHIA, sp. n. (Pl. XXXVIII. fig. 26.)

♂. Head, thorax, and abdomen yellow faintly tinged with rufous; palpi brownish; tarsi brownish with pale rings. Fore wing yellow irrorated and striated with pale rufous; a faint curved rufous medial shade rather darker at costa; a faint oblique shade across apex and blackish apical mark; cilia deep rufous. Hind wing yellow; a diffused black-brown band on termen from apex to vein 3, then incurved and not connected with the spot on termen at vein 1; cilia tinged with rufous from apex to vein 3. Underside of fore wing with the costal and terminal areas tinged with red and irrorated with brown points, a brownish discoidal point; hind wing with the costal area tinged with red except towards base and irrorated with brown points.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♂; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♂, Tanganyika plateau (*Neave*), 1 ♂ type. *Exp.* 24–28 mm.

PTEROTHYSANIDÆ.

HIBRILDES FLAVA Auriv. Trans. Ent. Soc. 1904, p. 697, pl. 33. ff. 5, 6.

N.E. RHODESIA, E. Luangwa distr.

HIBRILDES VENOSA Kirby, A. M. N. H. (6) xviii. p. 388, pl. 19. f. 4 (1896).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, E. Luangwa distr., upper Luangwa valley.

HIBRILDES NORAX Druce, P. Z. S. 1887, p. 675 (1888).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr.

HIBRILDES CRAUSHAYI Butl. A. M. N. H. (6) xviii. p. 162 (1896).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr., upper Luangwa valley.

The typical form is fulvous red; in some specimens the basal area of both wings is tinged with fuscous, in another there is a broad oblique ochreous white area beyond the cell of fore wing, in another the fore wing is suffused with fuscous leaving some ochreous white in cell, as streaks on inner area, and as a broad oblique postmedial band, the whole hind wing being suffused with fuscous.

The numerous specimens of *H. norax* and *venosa* are all males, whilst the fifteen specimens of *H. craushayi*, *ansorgei*, and *neavi* are all females. It seems possible that *H. venosa* is a variety of *norax* rather yellower with stronger streaks on the veins and an oblique shade across apical area of fore wing, and that *craushayi*, *ansorgei*, and *neavi* are all forms of the female, the two former having the terminal band of hind wing narrow; *craushayi* has the fore wing fulvous, the hind wing with fulvous subterminal spots, *ansorgei* fuscous, with a broad whitish postmedial band, the hind wing with white subterminal spots, whilst *neavi* has a very broad terminal band to hind wing, the subterminal spots very small and either white or fulvous. All the forms were taken in one district by Mr. Neave except typical *ansorgei*, which he did not get, though some of the varieties approach it: the type was taken in the same locality in E. Africa as the type of *venosa*. On the other hand, *H. flava* has a female similar to the male.

[*Hibrildes craushayi* Butler. There is nothing in my experience in the field which would make improbable Sir George Hampson's suggestion that this species and the new *H. neavi* are the females of *H. norax* and *venosa*. Both *craushayi* and *neavi* are remarkable Acræine mimics, the former of *Acræa natalica* Boisd., the latter, with its heavy black margins to the secondaries, of *Acræa anemosa* Hew.

I found both these species of *Acræa* extremely abundant at Petauke in the Luangwa valley, whence most of the specimens of *craushayi* and *neavi* come. These moths only resemble the large Acræas fairly well on the wing as their flight differs a good deal. At rest, however, the resemblance is remarkable, the moth resting hanging from a grass stem, etc., with wings folded above its back, *exactly* as the *Acræa* does.—S. A. N.]

HIBRILDES NEAVI, sp. n. (Pl. XXXVIII. fig. 18.)

♀. Head, thorax, and abdomen black-brown; frons orange; tegulæ, patagia, and metathorax with small paired white spots; abdomen with subdorsal and lateral series of paired white spots, sublateral orange fascia, and the anal extremity orange. Fore wing fulvous red with some blackish suffusion on basal half, the veins streaked with black; an irregular black discoidal bar, its inner edge concave, its outer somewhat dentate at the veins; the termen and cilia black, expanding into a patch on apical part of costa. Hind wing fulvous red with some blackish suffusion on basal half, the veins finely streaked with black; a black discoidal spot; the terminal area broadly black with minutely waved inner edge and more or less complete subterminal series of small white or orange spots.

Hab. N.W. RHODESIA, Kansanshi (*Neave*), 1 ♀ type; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 2 ♀. *Exp.* 60–70 mm.

LYMANTRIADÆ.

VIANA VELUTINA Wlk. Proc. Nat. Hist. Soc. Glasg. i. p. 341 (1869).

CONGO, Katanga, Kambove.

Pteredoa usebia Swinh. Trans. Ent. Soc. 1903, p. 382.

N.E. Rhodesia, E. Luangwa distr., Luangwa valley, Feira.

Pteredoa plumosa Hmpsn. Ann. S. Afr. Mus. iii. p. 412 (1905).

N.W. Rhodesia, Alala plateau; N.E. Rhodesia, Chambezi valley, Lake Bangweolo.

Redoa melanocraspis Hmpsn. Ann. S. Afr. Mus. iii. p. 393 (1905).

N.W. Rhodesia, Kapopo.

Naroma signifera Wlk. vii. 1744 (1856).

N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley.

Baziza percULTA Dist. A. M. N. H. (6) xx. p. 201 (1897).

Congo, Katanga, Kambove; N.E. Rhodesia, Chambezi valley, Fort Jameson.

Baziza phæophlebia, sp. n. (Pl. XXXVIII. fig. 11.)

♂. Head, tegulæ, and patagia deep orange; antennæ whitish, the branches brown; thorax ochreous white; palpi, pectus, femora, and abdomen fulvous orange; tibiæ and tarsi ochreous white streaked with black-brown above. Fore wing ochreous white, the veins finely streaked with dark brown. Hind wing pale ochreous, the veins of terminal half finely streaked with dark brown. Underside of both wings with the costal area fulvous orange, the terminal half of fore wing suffused with brown.

Hab. Congo, Katanga, Kambove (*Neave*), 1 ♂ type. *Exp.* 40 mm.

Baziza venata Swinh. A. M. N. H. (7) xvii. p. 546 (1906).

N.E. Rhodesia, Chambezi valley, Lake Bangweolo, Mansya R.

Olapa nuda Holl. Donaldson Smith's Travels, p. 409, pl. fig. 5 (1897).

Congo, Katanga, Kambove; N.W. Rhodesia, Alala plateau; N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley, Chambezi distr., Lake Bangweolo.

Olapa flabellaria Fabr. Mant. Ins. ii. p. 188 (1787).

Congo, Katanga, Kambove.

Olapa fulviceps, sp. n. (Pl. XXXVIII. fig. 15.)

♂. Head, thorax, and abdomen white, the head, tegulæ, patagia, and legs strongly tinged with orange fulvous; branches of antennæ pale rufous. Wings uniform hyaline white, the costal and inner areas of fore wing with a faint yellowish tinge, the costal edge pale fulvous.

Hab. Congo, S.E. Katanga (*Neave*), 3 ♂ type. *Exp.* 48 mm.

LÆLIA PHLEBITIS Hmpsn. Ann. S. Afr. Mus. iii. p. 394 (1905).

N.E. RHODESIA, E. Luangwa distr., upper Luangwa valley.

LÆLIA ADSPERSA Herr.-Schäff. Aussereur. Schmett. fig. 109 (1854).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr.

CIMOLA OPALINA Wlk. iv. 817 (1855).

N.W. RHODESIA, Alala plateau.

MARBLA DIVISA Wlk. iv. 815 (1855).

CONGO, Katanga, Kambove; N.W. RHODESIA, Kapopo; N.E. RHODESIA, Kalungwisi valley.

Genus LEPTAROA, nov.

Type, *L. fulvicolora.*

Palpi very short, porrect; eyes small; antennæ of male bipectinate with very long branches to apex, of female with shorter branches; build slender; tibiæ with the spurs short, the hind tibiæ with two pairs, the tarsal joints with tufts of hair above. Fore wing short and broad; veins 3 and 5 from near angle of cell; 6 from upper angle; 7, 8, 10 stalked, 9 absent, 10 from towards apex; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 from above angle; 6, 7 shortly stalked.

LEPTAROA FULVICOLORA, sp. n. (Pl. XXXVIII. fig. 5.)

♂ ♀. Head, thorax, and abdomen deep fulvous; antennæ with the branches dark brown. Fore wing deep fulvous; a greyish white, rather diffused, almost straight and erect subbasal line; two similar antemedial lines, the outer rather excurved at middle; two small black spots before the discocellulars and one beyond them; a rather diffused greyish white postmedial line excurved between vein 6 and submedian fold and somewhat bent outwards to inner margin; a slightly waved greyish white subterminal line, incurved below vein 3 and with the area beyond it somewhat darker. Hind wing deep fulvous with rather diffused darker terminal band. Underside fulvous orange; fore wing with blackish discoidal spot, the apical area suffused with fuscous; hind wing with blackish spot at upper angle of cell.

Ab. 1. ♂. Both wings orange-yellow with prominent dark brown terminal band.

Ab. 2. ♂. Similar, but without the dark terminal band. ♀. Yellowish white, the fore wing with the lines defined by orange-yellow.

Hab. CONGO, Katanga, Kambove (*Neave*), 6 ♂, 1 ♀ type, Lualaba R. (*Neave*), 1 ♂; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 13 ♂, 2 ♀, Luangwa valley (*Neave*), 2 ♂, Chinsali distr. (*Neave*), 2 ♂. *Exp.* 24–34 mm.

Bracharoa quadripunctata Wllgrn. Œfv. Vet.-Ak. Förh. 1875, p. 99.

N.E. Rhodesia, Chambezi valley, Lake Bangweolo.

Aroa discalis Wlk. iv. 792 (1855).

Congo, Katanga, Kambove; N.E. Rhodesia, Chinsali distr., Mansya R.

Aroa achrodisca, sp. n. (Pl. XXXVIII. fig. 30.)

♂. Head, thorax, and abdomen fuscous brown mixed with grey; palpi white below except at tips; fore coxæ in front, hind tibiæ and tarsi, and the ventral surface of abdomen whitish. Fore wing fuscous brown mixed with grey and suffused in parts with chocolate-red; a diffused dirty white band beyond the cell from below costa to above tornus, crossed by the slight reddish postmedial line incurved between vein 4 and submedian fold; an indistinct reddish subterminal line faintly defined on outer side by grey, excurved below vein 7 and at middle. Hind wing fuscous brown mixed with grey and faintly tinged with red, the apical area somewhat darker. Underside of fore wing with the band whiter; hind wing greyer with indistinct dark discoidal striga and oblique sinuous postmedial line.

Hab. Congo, Katanga, Kambove (*Neave*), 1 ♂ type. *Exp.* 26 mm.

Lacipa quadripunctata Dewitz, Verh. L.-C. Akad. xliii. p. 67, pl. iii. fig. 4 (1881).

N.W. Rhodesia, Alala plateau; N.E. Rhodesia, upper Luangwa valley, Bangweolo distr., Mansya R.

Lacipa gemmata Dist. A. M. N. H. (6) xx. p. 200 (1897).

N.W. Rhodesia, Alala plateau.

Euproctis sanguigutta Hmpsn. Ann. S. Afr. Mus. iii. p. 407 (1905).

N.E. Rhodesia, E. Luangwa distr., Petauke distr.

Euproctis stellata Dist. A. M. N. H. (6) xx. p. 202 (1897).

N.E. Rhodesia, Chambezi valley.

Euproctis fasciata Wlk. iv. 809 (1855).

N.E. Rhodesia, E. Luangwa distr.

Euproctis torrida Dist. A. M. N. H. (6) xx. p. 202 (1897).

N.E. Rhodesia, E. Luangwa distr., Chinsali distr., Kalungwisi valley.

Euproctis nephaloptera, sp. n. (Pl. XXXVIII. fig. 21.)

♂. Head, thorax, and abdomen yellow tinged with fulvous; antennæ with the branches brown; palpi with the 3rd joint black above; fore coxæ with some black; mid and hind tibiæ, the spurs and tarsi banded with black. Fore wing ochreous yellow, the costal area tinged with fulvous, the costal edge black at base; a diffused pale fuscous subbasal shade with minute black points on it from costa to submedian fold; a faint antemedial line, inwardly oblique from below costa to inner margin; medial area suffused with pale fuscous leaving a yellow patch from costa to lower angle of cell where it is slightly angled inwards, the outer edge of the dark area diffused outwards along vein 6, then curved; a subterminal series of small black spots excurved below vein 7 and with faint patches of dark scales beyond them on the veins. Hind wing yellow tinged with brown, the cilia yellow; the underside yellow with diffused brown postmedial shade.

Hab. N.E. RHODESIA, Chambezi valley (*Neave*), 1 ♂ type. *Exp.* 32 mm.

EUPROCTIS FULVIPENNIS, sp. n. (Pl. XXXVIII. fig. 31.)

Head and thorax fulvous orange; antennæ with the branches black; palpi with the 3rd joint blackish; anal tuft of female brownish grey. Fore wing fulvous orange; indistinct somewhat diffused and slightly sinuous whitish ante- and postmedial lines. Hind wing uniform fulvous orange.

Hab. N.W. RHODESIA, Kapopo (*Neave*), 1 ♂ type; N.E. RHODESIA, Kalungwisi valley (*Neave*), 1 ♂, 1 ♀. *Exp.* ♂ 30, ♀ 34 mm.

NYCTEMERA VARUNÆA Druce, P. Z. S. 1882, p. 780.

CONGO, Katanga, Kambove, Lualaba R.

[*Nyctemera varunæa* Druce.—This large species was not uncommon in Katanga. It is diurnal in its habits and has an extremely powerful flight. It usually flies very straight and at a good speed some 10 or 12 feet from the ground.—S. A. N.]

DASYCHIRA EDDELA Swinh. Trans. Ent. Soc. 1903, p. 494.

CONGO, Katanga, Kambove; N.W. RHODESIA, Alala plateau.

NUMENES LIBYRA Druce, A. M. N. H. (6) xvii. p. 353 (1896).

N.E. RHODESIA, E. Luangwa distr.

HOMOCHIRA RENDALLI Dist. A. M. N. H. (6) xx. p. 203 (1897).

N.E. RHODESIA, E. Luangwa distr.

LYMANTRIA FLAVICILIA, sp. n. (Pl. XXXVIII. fig. 14.)

♀. Head and thorax brown mixed with greyish; pectus pale; femora crimson above; abdomen crimson with subdorsal series of slight blackish spots and ventral series of black bands, the anal tuft yellowish. Fore wing fuscous brown mixed with some grey; traces of a curved antemedial line; a small black spot on a pale patch in end of cell and an oblique black discoidal lunule; traces of a diffused dark postmedial line defined on outer side by greyish, minutely dentate, excurved from costa to vein 4, then incurved; a very indistinct, dentate, subterminal line, incurved below vein 3 and bent outwards to tornus, the area beyond it greyer; cilia chequered black-brown and yellowish. Hind wing pale grey-brown, the inner margin ochreous white; cilia yellow at tips; the underside with slight blackish discoidal point.

Hab. N.E. Rhodesia, E. Luangwa distr., Petauke (*Neave*), 1 ♀ type. *Exp.* 54 mm.

Heteronygmia strigitorna, sp. n. (Pl. XXXVIII. fig. 24.)

♂. Head and thorax pale reddish brown; antennæ with the shaft whitish, the branches dark brown. Fore wing pale reddish brown with slight blackish discoidal point and traces of a subterminal series of blackish points in the interspaces. Hind wing pale yellowish faintly tinged with red-brown; a blackish bar above tornus; the underside with two blackish discoidal points, a curved postmedial line and subterminal series of slight diffused spots.

Hab. Congo, Katanga, Kambove (*Neave*), 1 ♂ type. *Exp.* 52 mm.

Heteronygmia leucogyna, sp. n. (Pl. XXXVIII. fig. 25.)

♂. Head and thorax pale red-brown; antennæ with the shaft whitish, the branches dark brown; antennæ ochreous white tinged with red-brown. Fore wing pale red-brown; a faint oblique sinuous brown antemedial line; a small black discoidal spot; a faint reddish medial line, angled outwards below costa, then oblique; postmedial line blackish, dentate, slightly incurved below vein 3; traces of a dark subterminal line. Hind wing yellowish white; the underside with blood-red striga at upper angle of cell and traces of a sinuous postmedial line.

♀. Head, thorax, and abdomen brownish white; fore wing brownish white, thinly scaled; a faint dark shade before the slight dark antemedial line, which is bent outwards from costa to median nervure, then sinuous; a sinuous dark medial shade; postmedial line very faint, waved, with maculate shade beyond it. Hind wing white, thinly scaled.

Hab. N.E. Rhodesia, E. Luangwa distr., Petauke (*Neave*), 8 ♂, 9 ♀ type. *Exp.* ♂ 40, ♀ 50–58 mm.

HYPSIDÆ.

Digama aganais Feld. Reis. Nov. pl. 106. fig. 21 (1874).
N.W. Rhodesia, Alala plateau.

Geodena accra Swinh. Trans. Ent. Soc. 1904, p. 149.
Congo, Katanga, Kambove.

GEODENA CONIFERA, sp. n. (Pl. XXXVIII. fig. 12.)

♀. Head, thorax, and abdomen fuscous slightly irrorated with grey, the tegulæ fulvous in front; palpi at base, neck, coxæ, and bases of femora and ventral surface of abdomen yellowish white, the last fulvous at extremity. Fore wing fuscous with a large white patch from subcostal nervure to inner margin extending from close to base to well beyond middle, its outer edge rather irregular; a conical white spot beyond the cell between veins 7 and 5, its upper edge rounded, its lower edge straight. Hind wing white with the terminal area fuscous, its inner edge irregular towards costa, deeply indented between veins 5 and 3 and running inwards on inner margin to near middle.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀ type. *Exp.* 40 mm.

DIOTA FASCIATA Auriv. Ent. Tidskr. 1897, p. 220.

N.E. RHODESIA, Kalungwisi valley.

DEILEMERA LEUCONOE Hopff. Monatsb. Akad. Berl. 1857, p. 422.

CONGO, Katanga, Kambove, Lualaba R.; N.W. RHODESIA, Kapopo; N.E. RHODESIA, E. Luangwa distr., Chambezi valley, Lake Bangweolo, Tanganyika plateau.

DEILEMERA ITOKINA Auriv. Ark. f. Zool. ii. 4, p. 40 (1904).

CONGO, Katanga, Kambove; N.E. RHODESIA, Chambezi valley, Chinsali distr., Lake Bangweolo, Mansya R.

DEILEMERA CHALCOSIDIA, sp. n. (Pl. XXXVIII. fig. 22.)

♀. Head black, the sides of frons white, the base of palpi and head just above and behind the eyes yellowish; thorax white with black stripes on vertex and patagia and spots on tegulæ, pectus tinged with yellow at sides, the legs striped black and white; abdomen yellowish white with slight black dorsal striæ on the segments and black ventral bands, the anal tuft orange. Fore wing fuscous brown with a rufous tinge; the basal half semi-hyaline white from below costa to inner margin, with slight dark streaks on the veins and in discal and submedian folds; a semi-hyaline white patch in end of cell bisected by the slight dark streak in discal fold, connected with a rather oblique quadrate patch between lower extremity of cell and submedian fold. Hind wing semi-hyaline yellowish white with black terminal band, broad at costa and narrowing to vein 2 where it terminates.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀ type. *Exp.* 44 mm.

ARGINA LEONINA Wlk. xxxi. 262 (1864).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr., N. Luangwa, Mt. Ulungu, Kalungwisi valley, Feira, Tanganyika plateau.

Argina amanda Boisd. Delegorgue's Voy. Afr. Austr. ii. p. 597 (1847).

Congo, Lualaba R.; N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley, Chambezi distr., Chinsali distr., Petauke distr., Fort Jameson; Portuguese E. Africa, Makanga distr.

Callioratis bellatrix Dalm. Anal. Ent. p. 50 (1823).

N.E. Rhodesia, Kalungwisi valley.

Phægorista similis Wlk. Proc. Nat. Hist. Soc. Glasg. i. p. 332, pl. 2. f. 4 (1879).

Congo, Katanga, Kambove.

Phægorista xanthosoma, sp. n. (Pl. XXXIX. fig. 12.)

♀. Palpi with the 2nd joint long, oblique, and dilated above at middle, the 3rd joint upturned and very long.

Head and thorax black-brown mixed with yellow and white; palpi yellow below towards base: fore and mid legs with the tibiæ and tarsi brown, hind legs with the spurs and extremities of tarsi brown; abdomen yellow with some white hair at base, a dorsal black patch at base followed by a series of fuscous dorsal bars, sublateral series of black bars. Fore wing black-brown with large triangular white patch between subcostal nervure and vein 1 from base to beyond middle, its outer edge oblique; a large oblique white patch beyond the cell from vein 7 to submedian fold near termen, its extremities rounded. Hind wing white with terminal black band. Underside of both wings with some yellowish at base.

Hab. N.E. Rhodesia, E. Luangwa distr., Petauke (*Neave*), 1 ♀ type. *Exp.* 52 mm.

SPHINGIDÆ.

Acherontianæ.

Herse convolvuli Linn. Syst. Nat. ed. x. p. 490 (1758).

N.E. Rhodesia, Fort Jameson.

Acherontia atropos Linn. Syst. Nat. ed. x. p. 490 (1758).

N.E. Rhodesia, E. Luangwa distr.

Ambulicinæ.

Platysphinx stigmatica Mab. Bull. Soc. Zool. Fr. ii. p. 491 (1878).

N.E. Rhodesia, E. Luangwa distr.

Leucophlebia xanthopis, sp. n. (Pl. XXXIX. fig. 15.)

♂. Palpi and frons crimson-red; head and thorax greyish ochreous tinged with pink, and with the dorsum of thorax red-brown in front with a slight yellow tuft on prothorax and some yellow on metathorax; antennæ fulvous; legs purplish pink; abdomen blackish with orange segmental bands, the ventral surface brownish ochreous tinged with pink, the anal tuft ochreous white. Fore wing pale purplish pink, the costal area ochreous white narrowing to apex, the costal edge yellow; a small discoidal ocellus with whitish centre and orange annulus defined by dark brown; an ochreous yellow fascia from base in submedian interspace, at lower angle of cell bent upwards obliquely to below apex and defined above by fuscous brown, its outer edge oblique and dentate on the veins, faintly defined by fuscous, a slight orange streak on it in submedian fold; cilia and the cilia of inner margin ochreous white. Hind wing deep orange, the cilia ochreous white. Underside of fore wing ochreous white faintly tinged with pink and with a large orange patch in, below, and beyond the cell; hind wing ochreous white.

Hab. CONGO, S.E. Katanga (*Neave*), 1 ♂ type. *Exp.* 56 mm.

POLYPTYCHUS CORYNDONI Roths. Nov. Zool. ix. Suppl. p. 251 (1903).

N.E. RHODESIA, Luangwa valley.

POLYPTYCHUS BAXTERI Roths. Nov. Zool. xv. p. 259 (1908). (Pl. XLI. fig. 14.)

N.E. RHODESIA, E. Luangwa distr.

POLYPTYCHUS NEAVI, sp. n. (Pl. XXXIX. fig. 26.)

♀. Head fiery rufous; tegulæ and patagia chocolate-brown, yellowish in front; thorax and abdomen yellowish rufous; palpi yellowish in front. Fore wing yellowish rufous, the veins with slight yellowish streaks, veins 7, 6 defined above by white towards termen; some blackish suffusion on inner margin near base; a small black-brown spot in end of cell with oblique shade from lower angle of cell to inner margin near tornus, its outer edge diffused; an oblique wedge-shaped blackish brown shade from apex to vein 7; cilia fiery rufous. Hind wing deep orange-red with a rather bidentate blackish patch on termen near tornus; cilia whitish at tips. Underside of fore wing orange-red, the terminal area brownish slightly tinged with grey and expanding at costa; hind wing pale orange-red.

Hab. N.E. RHODESIA, E. Luangwa distr., Petauke (*Neave*), 1 ♀ type. *Exp.* 66 mm.

POLYPTYCHUS NUMOSÆ Wllgrn. Wien. Ent. Mon. iv. p. 42 (1860).

N.E. RHODESIA, upper Luangwa valley.

SESIANÆ.

CEPHONODES HYLAS, Linn. Mant. Plant. p. 539 (1771).

CONGO, Katanga, Kambove, Lualaba R.; N.E. RHODESIA,

E. Luangwa distr., upper Luangwa valley, Chinsali distr., Kalungwisi valley, Fort Jameson; S. RHODESIA, Feira; PORTUGUESE E. AFRICA, Nyanji.

MACROGLOSSINÆ.

NEPHELE VAU Wlk. viii. 197 (1856).

N.E. RHODESIA, Fort Jameson.

NEPHELE COMMA Pffr. Monats. Akad. Wiss. Berlin, p. 421 (1857).

N.E. RHODESIA, E. Luangwa distr., Fort Jameson, Bangweolo distr.

NEPHELE ARGENTIFERA Wlk. viii. 194 (1856).

GERM. E. AFRICA, Dar-es-Salaam.

TEMNORA ELEGANS Roths. Iris, vii. p. 298 (1894); subsp. POLIA Roths. Nov. Zool. xi. p. 437 (1904).

N.E. RHODESIA, Lake Bangweolo, Serenji distr.

MACROGLOSSUM TROCHILUS Hübn. Samml. Ex. Schmett. ii. p. 158 (1827).

CONGO, Katanga, Kambove; N.E. RHODESIA, Serenji distr., E. Luangwa distr., Chambezi valley, Chinsali distr., Lake Bangweolo, Tanganyika plateau, Mansya R.

LEUCOSTROPHUS HIRUNDO Gerst. Arch. Naturg. xxxvii. p. 360 (1871).

N.E. RHODESIA, Serenji distr., E. Luangwa distr., Petauke distr.; S. RHODESIA, Feira.

PERGESINÆ.

BASIOTHIA MEDEA Fabr. Spec. Ins. ii. p. 143 (1781).

N.E. RHODESIA, Serenji distr., Fort Jameson.

HIPPOTION OSIRIS Dalm. Anal. Entom. p. 48 (1823).

N.E. RHODESIA, E. Luangwa distr.

[*Hippotion osiris* Dalm. As I have pointed out (Proc. Ent. Soc. 1905, p. xxiii), the larva of this species successfully imposes upon the natives by its terrifying appearance. It is one of the few species of Sphingid larvæ that the natives of the Luangwa valley do not eat and consider a delicacy.—S. A. N.]

HIPPOTION CELERIO Linn. Syst. Nat. ed. x. p. 491 1758).

N.E. RHODESIA, Serenji distr.

HIPPOTION ESON Cram. Pap. Exot. iii. p. 57, pl. 226. fig. C (1779).

CONGO, Katanga, Kambove; N.E. RHODESIA, Fort Jameson.

EUPTEROTIDÆ.

ACROJANA SCIRON Druce, P. Z. S. 1887, p. 676 (1888).

CONGO, Katanga, Kambove.

HOPLOJANA ANÆMICA, sp. n. (Pl. XXXIX. fig. 19.)

♂. Head, thorax, and abdomen pinkish rufous; shaft of antennæ whitish; palpi, lower part of frons, pectus and legs chocolate-brown. Fore wing very pale pinkish rufous, the long woolly hair at base rather deeper rufous; a slight discoidal spot formed of black scales; a slight inwardly oblique straight rufous line just beyond middle and a similar postmedial line very slightly defined on inner side by whitish. Hind wing very pale pinkish rufous, the long hair on basal inner area rather deeper rufous.

Hab. N.W. RHODESIA, Kapopo (*Neave*), 1 ♂ type. *Exp.* 94 mm.

JANA MARIANA White, A. M. N. H. xii. p. 264 (1843).

N.E. RHODESIA, Bangweolo distr.; PORTUGUESE E. AFRICA, Luangwa plain.

PHIALA HOLOGRAMMA Auriv. Trans. Ent. Soc. 1904, p. 697, pl. xxxiii. fig. 7.

CONGO, Katanga, Kambove.

PHIALA SIMPLEX Auriv. Trans. Ent. Soc. 1904, p. 695, pl. 33. fig. 1.

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Mpika.

PHIALA XANTHOSOMA Wllgrn. Wien. Ent. Mon. iv. p. 165 (1860).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Mansya R.

PHIALA RUBRIVENA, sp. n. (Pl. XXXIX. fig. 23.)

♂. Head white tinged with yellow; frons bright orange; palpi orange, black on outer sides; antennæ bright rufous, the shaft white; thorax white with a few long black hairs from patagia; pectus, legs, and abdomen orange, with tufts of long white hair from below shoulders, tarsi banded with black, abdomen with sublateral black bars. Fore wing creamy white, the veins strongly streaked with fulvous red except on costal area and the basal half of vein 5. Hind wing white, the veins slightly streaked with fulvous towards termen. Underside of fore wing, except inner area, and the costa of hind wing tinged with fulvous.

Hab. CONGO, S.E. Katanga (*Neave*), 1 ♂ type. *Exp.* 56 mm.

NOTODONTIDÆ.

SPATALIA ARGYROPHORA, sp. n. (Pl. XXXIX. fig. 14.)

♂. Head and thorax brownish grey with some long spatulate scales tipped with fiery red and dark brown; palpi and legs rufous, the tarsi slightly ringed with white; abdomen yellow, ventrally whitish. Fore wing yellow, thickly irrorated with fiery red, the terminal area greyish suffused and irrorated with red-brown, the veins streaked with fiery red except on terminal area; subbasal line double, fiery red with silver spots on and beyond it in submedian interspace; antemedial line double, fiery red filled in with silver spots, sinuous and inwardly oblique; a yellow discoidal bar filled in with fiery red; an oblique sinuous double red line filled in with silver from lower angle of cell to inner margin; postmedial line formed of silver lunules defined by red, arising below costa and incurved below vein 3, with silver spots beyond it between veins 6 and 3, followed by yellow bars defined by red with slight black irroration beyond them; a crenulate deep red subterminal line faintly defined on inner side by whitish; a fine dark terminal line; cilia with deep red line near tips which are white. Hind wing reddish brown, the cilia yellow. Underside of fore wing brown with the costa and termen rufous; hind wing yellowish white suffused with brown.

Hab. CONGO, S.E. Katanga (*Neave*), 1 ♂ type. *Exp.* 32 mm.

ICHTHYURA FERRUGINEA, sp. n. (Pl. XXXIX. fig. 25.)

♂. Head, thorax, and abdomen grey-white mixed with ferruginous red; antennæ rufous with the shaft white; palpi in front, pectus, legs, and ventral surface of abdomen whitish. Fore wing ferruginous red, the inner margin lilacine grey; a lilacine grey discoidal spot with whitish striga on it and ill-defined lilacine grey band from it to inner margin: a lilacine grey subterminal band from vein 7 to inner margin, excurved at middle; costa towards apex and cilia lilacine grey. Hind wing ferruginous red, the cilia white except at base; the underside white faintly tinged with ferruginous.

Hab. N.E. RHODESIA, Kalungwisi valley (*Neave*), 1 ♂ type. *Exp.* 38 mm.

RIGEMA ORNATA Wlk. xxxii. 437 (1865).

N.E. RHODESIA, E. Luangwa distr.; PORTUGUESE E. AFRICA, Chinde.

ZANA GALLANS Karsch, Ent. Nachr. xxi. p. 365, pl. iv. fig. 8 (1895).

N.E. RHODESIA, Petauke distr.

PHALERA LATIPENNIS Butl. P. Z. S. 1896, p. 844, pl. 42. fig. 3.

N.E. RHODESIA, E. Luangwa distr.

GALONA SERENA Karsch, Ent. Nachr. xxi. p. 363, pl. iii. fig. 1 (1895), ♂.

Galona pyrrhotricha Karsch, Ent. Nachr. xxi. p. 364, pl. iii. fig. 2 (1895), ♀.

N.E. RHODESIA, E. Luangwa distr., Petauke. 1 ♂, 1 ♀ taken in copula.

GEOMETRIDÆ.

BOARMIANÆ.

PIGIOPSIS CONVERGENS Warr. Nov. Zool. vi. p. 301 (1899).

N.W. RHODESIA, Kapopo.

STEGANIA DIAGRAMMA, sp. n. (Pl. XXXIX. fig. 13.)

♂. Head rufous; thorax and abdomen yellow tinged with rufous; fore legs red-brown in front. Fore wing yellow irrorated with rufous, the costa striated with red-brown; a slight red-brown antemedial mark on costa; a nearly straight erect medial red-brown line with a black point on it on costa; a red-brown postmedial line excurved at discal fold where it gives off a streak to termen, and towards tornus where it terminates; a terminal series of blackish points. Hind wing yellow thickly irrorated with rufous; a slightly curved antemedial red-brown line with the black discoidal point just beyond it; a red-brown subterminal line angled outwards to termen at discal fold; a terminal series of slight blackish points. Underside paler; fore wing with the postmedial line dilated at discal fold, but not emitting a streak to termen.

Hab. N.E. RHODESIA, Chambezi valley (*Neave*), 1 ♂ type. *Exp.* 22 mm.

STEGANIA GLAUCICHROA, sp. n. (Pl. XXXIX. fig. 1.)

♂. Head and neck fiery red, the vertex of head and shaft of antennæ above towards base pure white; thorax and abdomen purplish grey, pectus and ventral surface of abdomen whitish. Fore wing purplish grey irrorated with red-brown, the costal edge rufous; a chocolate-brown antemedial line, bent outwards below costa, then waved; a chocolate-brown discoidal bar; postmedial line chocolate-brown, dentate below veins 7, 6, incurved at discal and submedian folds, excurved and slightly dentate between those points; a slight subterminal patch of chocolate-brown suffusion at discal fold; a terminal chocolate-brown line. Hind wing purplish grey thickly irrorated with red-brown; postmedial line chocolate-brown slightly defined on each side by whitish, oblique, sinuous, excurved between veins 4 and 2; a chocolate-brown terminal line; the underside uniform grey-white.

Hab. N.E. RHODESIA, Chambezi valley (*Neave*), 2 ♂ type. *Exp.* 26–34 mm.

STEGANIA EURYCRASPIS, sp. n. (Pl. XXXIX. fig. 2.)

♀. Head, thorax, and abdomen orange-yellow; antennæ brown. Fore wing orange-yellow irrorated with raised silvery scales and a few black scales; the costal edge tinged with rufous; a black discoidal point and traces of a sinuous line from below costa to inner margin; postmedial line double, the inner line hardly traceable, slightly excurved below costa and at middle, the area beyond it bright rufous with slight blackish marks in the interspaces representing the subterminal line and forming a diffused patch above inner margin; a terminal series of black points; cilia blackish and silvery at base, grey at tips. Hind wing orange-yellow irrorated with silvery and a few black scales; a black discoidal point; postmedial line rufous with the area beyond it rufous irrorated with silvery scales; some faint blackish marks in the interspaces representing the subterminal line; cilia blackish and silvery at base, grey at tips; the underside yellow striated with brown especially on terminal area.

Hab. N.E. RHODESIA, Mansya R. (*Neave*), 1 ♀ type. *Exp.* 34 mm.

SCARDAMIA MACULATA Warr. Nov. Zool. iv. p. 240 (1897).

N.E. RHODESIA, E. Luangwa distr.

HYPERYTHRA LUCICOLOR Butl. A. M. N. H. (4) xvi. p. 417 (1875).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley, Lake Bangweolo distr.

HYPERYTHRA SUBAPICATA Warr. Nov. Zool. vi. p. 308 (1899).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Lake Bangweolo distr.

HYPERYTHRA OLIVATA Warr. Nov. Zool. iv. p. 253 (1897).

N.E. RHODESIA, Luangwa valley.

OSTEODES TURBULENTATA Guen. Ur. & Phal. ii. p. 177 (1857).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Tanganyika plateau.

MACARIA CRASSATA Warr. Nov. Zool. ix. p. 110 (1902).

CONGO, Katanga, Kambove; N.W. RHODESIA, Kapopo.

MACARIA RECTISTRIARIA Herr.-Schäff. Aussereur. Schmett. f. 197 (1854).

CONGO, Katanga, Kambove; N.E. RHODESIA, Luangwa valley, Chinsali distr.

MACARIA RHABDOPHORA Holl. Entom. xxv. Suppl. p. 95 (1892).

N.E. RHODESIA, Kalungwisi valley, Lake Bangweolo distr.

MACARIA ZOMBINA Butl. P. Z. S. 1893, p. 683.

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr., Mt. Ulungu, Chambezi valley, Kalungwisi valley, Bangweolo distr., Mansya R.

MACARIA JOHNSTONI Butl. P. Z. S. 1893, p. 683.

N.E. RHODESIA, Tanganyika plateau, Chinsali distr.

MACARIA AMANDATA Wlk. xxiii. 922 (1861).

CONGO, S.E. Katanga; N.W. RHODESIA, Kapopo; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Kalungwisi valley.

MACARIA LARGIFICARIA Möschl. Abh. Senck. Ges. xv. p. 95, f. 20 (1889).

N.E. RHODESIA, E. Luangwa distr., Chambezi valley.

MACARIA UNIFILATA Warr. Nov. Zool. vi. p. 307 (1899).

N.E. RHODESIA, E. Luangwa distr., upper Luangwa valley, Fort Jameson.

MACARIA LATARIA Wlk. xxiii. 921 (1861).

N.E. RHODESIA, Tanganyika plateau.

MACARIA CRASSILIMBARIA Mab. C. R. Soc. Ent. Belg. xxiii. p. 23 (1880).

N.E. RHODESIA, Luangwa valley, Chambezi valley.

MACARIA BRONGUSARIA Wlk. xx. 123 (1860).

CONGO, S.E. Katanga; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley, Tanganyika plateau.

MACARIA TESTACEATA Wlk. xxvi. 1575 (1862).

N.E. RHODESIA, E. Luangwa distr., N. Luangwa, Mt. Ulungu, Chambezi valley.

MACARIA MAJESTICA Warr. Nov. Zool. viii. p. 213 (1901).

CONGO, Katanga, Kambove; N.E. RHODESIA, Luangwa valley, N. Luangwa, Mt. Ulungu, Bangweolo distr.

TEPHRINA PRESBITARIA Swinh. Trans. Ent. Soc. 1904, p. 511.

N.E. RHODESIA, Luangwa valley.

TEPHRINA DEERARIA Wlk. xxiii. 962 (1861).

N.E. RHODESIA, Luangwa valley.

TEPHRINA EXOSPILATA Wlk. xxiii. 987 (1861).

N.E. RHODESIA, N. Luangwa, Mt. Ulungu, Lake Bangweolo distr.

Tephrina catalaunaria Guen. Ur. & Phal. ii. p. 108 (1857).

N.E. Rhodesia, Chambezi valley, Bangweolo distr.

Tephrina cinerescens Butl. A. M. N. H. (4) xvi. p. 418 (1875).

N.W. Rhodesia, Kafue valley; N.E. Rhodesia, Chambezi valley.

Tephrina furcata Warr. Nov. Zool. iv. p. 112 (1897).

N.E. Rhodesia, Luangwa valley.

Tephrina inconspicua Warr. Nov. Zool. iv. p. 113 (1897).

N.E. Rhodesia, Luangwa valley.

Tephrina ochriciliata Warr. Nov. Zool. viii. p. 214 (1901).

N.W. Rhodesia, Alala plateau; N.E. Rhodesia, E. Luangwa distr.

Tephrina observata Wlk. xxiii. 963 (1861).

N.E. Rhodesia, E. Luangwa distr., Luangwa valley, Lake Bangweolo distr.

Tephrina arcifera, sp. n. (Pl. XXXIX. fig. 3.)

♂. Head, thorax, and abdomen pale yellow; antennæ brownish. Fore wing pale yellow striated with brown; a blackish antemedial point in lower part of cell and discoidal point; the costa black towards apex; postmedial line olive-brown defined on inner side by clear yellow and on outer by dark brown, arising from termen just below apex and obliquely incurved, the area beyond it tinged with purplish brown; some black points on termen from apex to vein 5; cilia blackish at tips towards apex. Hind wing pale yellow striated with brown; a brown discoidal bar; postmedial line olive-brown defined on inner side by clear yellow and on outer by dark brown, some purplish-grey suffusion beyond it towards costa; cilia whitish at tips. Underside of both wings yellow, the brown striæ strong, thickly disposed on basal half, black discoidal bars; fore wing with the postmedial line formed of blackish marks, forking below vein 4 and not extending below submedian fold; hind wing with the postmedial line formed by a double series of blackish marks, coalescing towards costa.

Hab. N.E. Rhodesia, Bangweolo distr. (*Neave*), 1 ♂ type. *Exp.* 30 mm.

Zamarada rufilineária Swinh. Trans. Ent. Soc. 1904, p. 516.

N.E. Rhodesia, E. Luangwa distr., Luangwa valley.

Zamarada denticincta, sp. n. (Pl. XXXIX. fig. 6.)

♂. Head, thorax, and abdomen rufous mixed with grey; antennæ dark brown. Fore wing semihyaline yellow with a pearly gloss; the costa orange sparsely striated with black, a black discoidal point; postmedial line black slightly defined on outer side by silvery grey, not quite reaching costa, waved, excurved at middle and incurved from above vein 2; the terminal area grey-brown striated with fuscous; a silvery subterminal line defined on inner side by black-brown, dentate towards costa, waved below vein 5 and incurved below vein 2; a fine black terminal line and fine silvery line at base of cilia. Hind wing semihyaline yellow with a pearly gloss; postmedial line black defined on outer side by silvery grey, sinuous, excurved between veins 5 and 2; terminal area grey-brown striated with fuscous; a silvery subterminal line defined on inner side by black-brown especially towards costa and tornus, interrupted by black-brown at discal fold, waved towards costa, then slightly sinuous; a fine black terminal line and fine silvery line at base of cilia.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 3 ♂ type, Chambezi valley (*Neave*), 1 ♂; TRANSVAAL, White R. (*Cooke*), 1 ♂. *Exp.* 30-34 mm.

ZAMARADA CHRYSOTHYRA Hmpsn. Trans. Zool. Soc. xix. p. 122, pl. iv. f. 50 (1909).

N.E. RHODESIA, E. Luangwa distr., Chambezi valley.

ZAMARADA FLAVICOSTA Warr. Nov. Zool. iv. p. 122 (1897).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

ZAMARADA FLAVICAPUT Warr. Nov. Zool. viii. p. 212 (1901).

N.E. RHODESIA, E. Luangwa distr.

ZAMARADA PYROCINCTA, sp. n. (Pl. XXXIX. fig. 5.)

Head, thorax, and abdomen rufous mixed with grey and slightly irrorated with black; antennæ with the branches blackish; ventral surface of abdomen grey. Fore wing semihyaline yellow with a pearly gloss; the costa ochreous striated with black; a black discoidal spot; postmedial line black, not quite reaching costa, towards which it is slightly waved, excurved between veins 4 and 2; terminal area bright rufous irrorated with black; a silvery subterminal line defined on inner side by fiery red and by a slight black spot below costa, dentate to vein 5, then waved, incurved below vein 2; a series of black points at base of cilia. Hind wing semihyaline yellow with a pearly gloss, the inner area slightly striated with fuscous; a black discoidal point; postmedial line black, excurved below vein 7 and between veins 4 and 2; terminal area bright rufous irrorated with black; a silvery subterminal line defined on inner side by fiery red, waved towards costa; a series of black points at base of cilia.

Ab. 1. Head, thorax, and abdomen, terminal area of both wings and costa of fore wing much redder; both wings with the discoidal points red, the postmedial line red slightly defined on outer side by silver; the costa of fore wing and terminal area of both wings with hardly a trace of black irroration; a fine red terminal line and no black points at base of cilia.

Hab. CONGO, Katanga, Kambove (*Neave*), 3 ♂ type; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 11 ♂, 6 ♀, Chambezi valley (*Neave*), 2 ♂, 1 ♀, Bangweolo distr. (*Neave*), 1 ♀, Mansya R. (*Neave*), 1 ♀. *Exp.* 24–32 mm.

ZAMARADA FLAVICINCTA, sp. n. (Pl. XXXIX. fig. 4.)

♂. Head, thorax, and abdomen fiery red mixed with grey and irrorated with black; antennæ with the branches blackish; ventral surface of abdomen pale. Fore wing semihyaline yellow with a pearly gloss and some fuscous striæ on median nervure and inner margin, the costal area yellow tinged with fiery red and striated with black; a small black discoidal spot; postmedial line black defined on outer side by silvery scales, not quite reaching costa, minutely waved, strongly excurved between veins 4 and 2, then bent inwards; terminal area yellow suffused with fiery red and irrorated with black; a dentate silvery subterminal line defined on inner side by yellow; a series of small black spots at base of cilia. Hind wing semihyaline yellow with a pearly gloss and slightly striated with blackish; a small black discoidal spot; postmedial line black defined on outer side by silvery scales, excurved below vein 7, excurved and somewhat dentate between veins 4 and 2; terminal area yellow suffused with fiery red and irrorated with black; a waved silvery subterminal line defined on inner side by yellow; a series of small black spots at base of cilia.

♀. Wings more thickly striated with black, the postmedial line with some fuscous suffusion beyond it.

Ab. 1. Both wings with diffused rufous discoidal spots, the postmedial line red-brown.—Nigeria.

Hab. S. NIGERIA, Abutshi (*Newman*), 1 ♂; N.E. RHODESIA N. Luangwa, Mt. Ulungu (*Neave*), 4 ♂, E. Luangwa distr. (*Neave*), 2 ♂ type, Chambezi valley (*Neave*), 1 ♂, 1 ♀; MASHONALAND, Salisbury (*Marshall*), 2 ♂. *Exp.* 26 mm.

HYPHENOPHORA ÆMONA Swinh. Trans. Ent. Soc. 1904, p. 498.

N.E. RHODESIA, Kalungwisi valley.

NASSUNIA PETAVIA Stoll, Pap. Exot. iv. p. 111, pl. 347. f. F (1783).

N.W. RHODESIA, Alala plateau.

CŒNINA PŒCILARIA Herr.-Schäff. Aussereur. Schmett. ff. 192, 193 (1854).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, E. Luangwa distr., Chambezi valley.

Hæmatorithra rubrifasciata Butl. A. M. N. H. (6) xviii. p. 106 (1896).

N.E. Rhodesia, E. Luangwa distr.; Portuguese E. Africa, S. Angoniland.

Psilocerea craspigonia Hmpsn. Trans. Zool. Soc. xix. p. 124, pl. iv. f. 55 (1909).

N.W. Rhodesia, Alala plateau.

Mesocœla rufescens, sp. n. (Pl. XXXIX. fig. 9.)

♂. Head, thorax, and abdomen ochreous tinged with rufous; antennæ brown; fore and mid tibiæ blackish at extremities. Fore wing ochreous suffused with rufous; some dark striæ on costa; a medial line oblique and dark from costa to vein 6 just beyond the cell, then inwardly oblique and hardly traceable; a dark postmedial spot on costa with curved series of three points below it; an oblique dark line from costa just before apex, towards which it is somewhat diffused, to inner margin; cilia dark at tips except towards tornus. Hind wing ochreous suffused with rufous except on basal and costal areas; an indistinct dark antemedial line; a curved dark postmedial line with series of black points before it; the underside striated with brown, the lines more distinct, the antemedial line excurved at middle.

♀. Wings pale ochreous irrorated and striated with red-brown, the lines more distinct and diffused; fore wing with antemedial line angled outwards on median nervure, then oblique; the medial line diffused and sinuous from vein 6 to inner margin, the postmedial line with rufous suffusion beyond it; a pale subapical lunule.

Hab. N.E. Rhodesia, Luangwa valley (*Neave*), 11 ♂, 2 ♀ type. *Exp.*, ♂ 42, ♀ 44 mm.

Mesocœla flavimacula, sp. n. (Pl. XXXIX. fig. 8.)

♂. Head, thorax, and abdomen purplish grey-brown; antennæ dark brown. Fore wing purplish grey-brown with slight dark irroration; a black discoidal point placed on an oblique diffused fuscous patch from costa and with traces of an oblique dark line from it to inner margin; a slight dentate whitish postmedial line with black suffusion before it towards costa, oblique below vein 6 and with series of black points on it, some black beyond it between veins 7, 6, followed by an ochreous white lunule before the slight curved brown subterminal line defined on outer side by white towards costa. Hind wing purplish grey-brown with slight dark irroration; an indistinct oblique rather diffused dark antemedial line; a black discoidal point; traces of a curved postmedial line with series of slight black points on it; the underside greyer sparsely striated with brown, a black discoidal point and traces of a curved postmedial series of black points.

Hab. N.E Rhodesia, Luangwa valley (*Neave*), 1 ♂ type. *Exp.* 38 mm.

CHORODNODES ROTHI Warr. Nov. Zool. iv. p. 105 (1897).

CONGO, Katanga, Kambove; N.W. RHODESIA, Kapopo.

BOARMIA ACACIARIA Boisd. Faun. Ent. Madag. p. 116, pl. 16. f. 4 (1834).

CONGO, Katanga, Kambove.

BOARMIA PALLIDIZONA, sp. n. (Pl. XXXIX. fig. 7.)

Antennæ of male pectinate; hind tibiæ not dilated; fore wing with fovea.

♂. Head, thorax, and abdomen brownish grey mixed with black; pectus and ventral surface of abdomen whitish. Fore wing brownish grey thickly irrorated and striated with black, the costa yellowish; an oblique whitish band beyond the medial line extending to just beyond the postmedial line; subbasal line represented by black points on costa and median nervure; antemedial line indistinct, black; curved; a small black discoidal spot; medial line black, oblique, slightly excurved from costa to submedian fold; postmedial line indistinct, punctiform, oblique below vein 4; subterminal line represented by two black marks on costa and an incurved line from vein 4 to inner margin; a terminal series of black striæ; cilia whitish intersected with black. Hind wing brownish grey thickly irrorated and striated with black, an oblique whitish band beyond the medial line extending to just beyond the postmedial line; medial line black, slightly excurved at median nervure; a small black discoidal spot; a slight punctiform postmedial line; traces of a pale waved subterminal line; a lunulate black terminal line. Underside paler with fuscous suffusion beyond the oblique white band on both wings.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♂; MASHONALAND, Salisbury (*Marshall*), 1 ♂ type. *Exp.* 30 mm.

BOARMIA (HEMEROPHILA) ACYGONIA, sp. n. (Pl. XXXIX. fig. 37.)

♂. Head and thorax red-brown mixed with whitish; palpi and frons dark brown; antennæ with the branches black; abdomen whitish irrorated with brown and dorsally tinged with red-brown. Fore wing whitish, the basal area suffused with red-brown and irrorated with black, bounded by the black antemedial line which is erect to submedian fold, then bent inwards to inner margin; medial area slightly striated with brown, the costa with black striæ; postmedial line black, obliquely incurved from costa to vein 5, where it is acutely angled inwards, then again incurved, the area beyond it suffused with red-brown and irrorated with black except a patch below apex; some black striæ on apical part of costa and a diffused black mark from termen to the angle of postmedial line; a terminal series of black lunules. Hind wing whitish tinged with rufous and slightly irrorated with black; postmedial line black, excurved between veins 6 and 5, then incurved; a maculate whitish subterminal band from above vein 6 to tornus; a waved black terminal line; the underside silky white slightly irrorated with brown, a brown discoidal spot, the postmedial line indistinct.

Hab. N.E. Rhodesia, Bangweolo distr. (*Neave*), 1 ♂ type. *Exp.* 46 mm.

Boarmia subaurata Warr. Nov. Zool. vi. p. 306 (1899).

Congo, Katanga, Kambove; N.E. Rhodesia, Bangweolo distr.

Boarmia nigripunctata Warr. Nov. Zool. iv. p. 93 (1897).

N.E. Rhodesia, Chambezi valley, Lake Bangweolo distr.

Nothabraxas simplex Warr. Nov. Zool. iv. p. 89 (1897).

Congo, Katanga, Kambove; N.E. Rhodesia, Mansya R.

Pitthea continua Wlk. ii. 463 (1854).

Congo, Katanga, Kambove.

Pitthea famula Drury, Ill. Exot. Ins. ii. p. 19, pl. 11. f. 3 (1782).

N.E. Rhodesia, Kalungwisi valley.

Terina puncticorpus Warr. Nov. Zool. iv. p. 240 (1897).

N.E. Rhodesia, Chambezi valley, Lake Bangweolo distr.

Terina internata Warr. Nov. Zool. xvi. p. 118 (1909).

Congo, Katanga, Kambove, Lualaba R.

Terina crocea, sp. n. (Pl. XXXIX. fig. 36.)

Head, thorax, and abdomen black; frons with white bar; shoulders with small yellow spots; pectus at sides with white spots; legs streaked with white; abdomen with dorsal, lateral, and sublateral series of small white spots. Fore wing black; a white point at base; a yellow patch extending from close to base below costa to middle and on inner margin to near tornus, its outer edge obliquely curved; an oblique elliptical yellow patch across apical area from or from just below costa to near termen below vein 3. Hind wing orange-yellow, the inner margin narrowly black; a terminal black band expanding on apical area and towards tornus. Underside of fore wing of male with the retinaculum white.

Hab. Congo, Lualaba R. (*Neave*), 1 ♂ type; N.W. Rhodesia, Alala plateau (*Neave*), 1 ♀. *Exp.* ♂ 38, ♀ 36 mm.

Aletis helcita Clerck, Icones, pl. 39. f. 4 (1764).

Congo, Katanga, Kambove.

Aletis monteironis Druce, Ent. Mo. Mag. xx. p. 156 (1883).

Congo, Katanga, Kambove.

ANNEMOPSYCHE CHARMIONE Fabr. Ent. Syst. iii. (1) p. 205 (1793).

CONGO, Lualaba R.

HYLEMERA OCTOGESA Druce, P. Z. S. 1887, p. 672, pl. 55. f. 1 (1888).

CONGO, Katanga, Kambove.

HYLEMERA NEÆRA Druce, P. Z. S. 1887, p. 672 (1888).

CONGO, Katanga, Kambove.

GEOMETRINÆ.

THALASSODES NIGRIPUNCTATA Warr. Nov. Zool. iv. p. 46 (1897).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Chambezi valley.

PRASINOCYMA VERMICULARIA Guen. Ur. & Phal. i. p. 359 (1857).

N.E. RHODESIA, E. Luangwa distr.

PRASINOCYMA RHODOCERA, sp. n. (Pl. XXXIX. fig. 29.)

♀. Head, thorax, and abdomen green; palpi, frons, and antennæ deep blood-red; abdominal crests red; pectus and ventral surface of abdomen yellowish white, the legs red. Fore wing emerald-green striated with white; the costa yellowish white; the cilia yellowish white tinged with blood-red at tips. Hind wing emerald-green striated with white; cilia yellowish white tinged with blood-red at tips; the underside greenish white.

Hab. N.W. RHODESIA, Alala plateau (*Neave*), 1 ♀ type. *Exp.* 34 mm.

AGRAPTOCHLORA DILATATA Wlk. xxi. 594 (1860).

N.W. RHODESIA, Alala plateau.

HEMITHEA ALBISTRIGULATA Warr. Nov. Zool. iv. p. 39 (1897).

N.E. RHODESIA, E. Luangwa distr.

NEMORIA UNILINEA Warr. Nov. Zool. iv. p. 40 (1897).

N.E. RHODESIA, upper Luangwa valley, E. Luangwa distr.

COMIBÆNA LEUCOSPILATA Wlk. xxvi. 1554 (1862).

N.E. RHODESIA, E. Luangwa distr.

COMIBÆNA RHODOSTICTA, sp. n. (Pl. XXXIX. fig. 30.)

Head, thorax, and abdomen green mixed with some deep blood-red; palpi red, white at tips; frons red, white below; antennæ white; pectus and ventral surface of abdomen white; legs blood-red. Fore wing emerald-green thickly striated with white; the costa white with a blood-red streak below it; a blood-red discoidal spot and postmedial patch between veins 3 and 2 varying in size; some white on termen and a fine blood-red terminal line; cilia white intersected by blood-red streaks. Hind wing emerald-green thickly striated with white; a blood-red discoidal spot: some white on termen and a fine blood-red terminal line; cilia white intersected with red; the underside greenish white.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 3 ♂, 4 ♀ type; MASHONALAND (*Dobbie*), 1 ♀. *Exp.* ♂ 30, ♀ 38 mm.

NEUROTOCA ENDORHODA, sp. n. (Pl. XXXIX. fig. 31.)

♂. Head white, the antennæ with some deep blood-red; thorax green with blood-red patch on prothorax; abdomen deep blood-red, green at extremity. Fore wing emerald-green; the costal area white; a curved white antemedial line; postmedial line white, oblique; cilia white. Hind wing emerald-green with deep blood-red patch on middle of inner margin; an oblique white medial line; cilia white; the underside greyish white.

Hab. N.E. RHODESIA, Fort Jameson (*Neave*), 1 ♂ type. *Exp.* 30 mm.

ACOLLESIS TRILINEATA, sp. n. (Pl. XXXIX. fig. 32.)

Head, thorax, and abdomen emerald-green; palpi and frons blood-red; antennæ white with the branches blood-red; legs blood-red. Fore wing emerald-green; the costa narrowly white; a fine oblique white antemedial line not quite reaching costa; a stronger oblique white postmedial line not reaching costa; a fine white subterminal line not reaching costa or inner margin; cilia white at tips. Hind wing emerald-green with strong minutely waved white postmedial line and slight minutely waved white subterminal line; cilia white at tips.

Hab. N.W. RHODESIA, Alala plateau (*Neave*), 2 ♂ type, Lake Bangweolo (*Neave*), 1 ♂, Tanganyika plateau (*Neave*), 1 ♀; MASHONALAND (*Dobbie*), 1 ♀. *Exp.* ♂ 26, ♀ 28 mm.

COLLESIS MIMICA Warr. Nov. Zool. iv. p. 37 (1897).

N.E. RHODESIA, E. Luangwa distr.

AIDALIANÆ.

EPHYRA ANANDARIA Swinh. Trans. Ent. Soc. 1904, p. 461.

N.E. RHODESIA, E. Luangwa distr.

ANISODES INÆQUALIS Warr. Nov. Zool. ix. p. 501 (1902).

N.E. RHODESIA, Chambezi valley.

ERYTHROLOPHA TRISINUATA Warr. Nov. Zool. ix. p. 56 (1897).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley.

TIMANDRA RUFA Warr. Nov. Zool. iv. p. 65 (1897).

N.E. RHODESIA, E. Luangwa distr.

TIMANDRA NEPTUNARIA Guen. Ur. & Phal. ii. p. 3, pl. 18. f. 5 (1857).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley; PORTUGUESE E. AFRICA, Chinde.

TIMANDRA NIGRIPUNCTA Warr. Nov. Zool. iv. p. 225 (1897).

N.E. RHODESIA, upper Luangwa valley, Chinsali distr.

TIMANDRA GLAUCA Warr. Nov. Zool. iv. p. 64 (1897).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Bangweolo distr.

TRYGODES DENTILINEA Warr. Nov. Zool. iv. p. 47 (1897).

N.E. RHODESIA, Lake Bangweolo.

PROBLEPSIS VESTALIS Butl. A. M. N. H. (4) xvi. p. 419 (1875).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

INDUNA RUFISALSA Warr. Nov. Zool. iv. p. 368 (1897).

N.E. RHODESIA, Luangwa valley.

INDUNA CURVIMARGO Warr. Nov. Zool. viii. p. 92 (1900).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley.

INDUNA NUBICINCTA, sp. n. (Pl. XXXIX. fig. 24.)

♂. Head, thorax, and abdomen ochreous white slightly tinged with reddish brown; palpi at tips and frons black; fore and mid legs fuscous in front. Fore wing pale ochreous slightly irrorated with reddish brown; antemedial line reddish brown, oblique from costa to middle of cell, then incurved; a black discoidal striga; medial line reddish brown, oblique from costa to vein 6, then inwardly oblique and sinuous; postmedial line reddish brown, excurved below costa, then oblique and sinuous, the area beyond it suffused with red-brown except at apex; a slight waved subterminal shade bent outwards to termen below apex; a fine brown terminal line and a line near tips of cilia. Hind wing pale ochreous irrorated with reddish brown, the terminal area suffused with red-brown; a reddish-brown medial line slightly excurved at middle; a black discoidal point; postmedial line reddish brown, excurved and slightly sinuous; a faint sinuous subterminal shade; a fine brown terminal line; the underside ochreous white slightly irrorated with brown, a black discoidal point and sinuous excurved postmedial line.

Hab. N.E. RHODESIA, E. Luangwa distr., Mbala country (*Neave*), 1 ♂ type. *Exp.* 30 mm.

Craspedia deserta Warr. Nov. Zool. iv. p. 51 (1897).

N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley, Chambezi valley.

Craspedia tricommata Warr. Nov. Zool. vi. p. 294 (1899).

N.E. Rhodesia, Chambezi valley.

Craspedia internata Guen. Ur. & Phal. i. p. 506 (1857).

N.E. Rhodesia, E. Luangwa distr.

Craspedia pulverosaria Wlk. xxvi. 1605 (1862).

N.E. Rhodesia, E. Luangwa distr., Luangwa valley.

Craspedia diffusizona, sp. n. (Pl. XXXIX. fig. 34.)

Head, thorax, and abdomen pale ochreous tinged with reddish brown and irrorated with black; palpi blackish at tips; frons red-brown. Fore wing pale ochreous irrorated with black; a faint diffused curved brown antemedial line; a black discoidal point; postmedial line brown, oblique from costa to vein 6, incurved at discal fold, angled outwards below vein 4, then incurved, a diffused fuscous-brown band beyond it, bent out to termen below apex and strongest at discal fold and below vein 3; a fine punctiform black terminal line. Hind wing pale ochreous irrorated with black; a diffused brown antemedial line; a black discoidal point; postmedial line brown, excurved at middle and with a diffused reddish-brown band beyond it; a fine punctiform black terminal line; the underside pale ochreous irrorated with black, a black discoidal point and sinuous brown postmedial line.

Hab. Br. E. Africa, Njoro (*Cholmley*), 1 ♀; N.E. Rhodesia, Chambezi valley (*Neave*), 1 ♂ type. *Exp.* ♂ 28, ♀ 32 mm.

Craspedia glaucocyma, sp. n. (Pl. XXXIX. fig. 33.)

Head, thorax, and abdomen white tinged with olive-brown; frons black. Fore wing white irrorated with a few black scales; the basal area with two faint oblique diffused olive bands from below costa to inner margin; antemedial line pale olive, diffused, oblique from costa to middle of cell, then inwardly oblique; a black discoidal point; medial line pale olive, rather diffused, excurved below costa, then oblique, sinuous; two oblique sinuous pale olive postmedial bands; a slight waved pale olive subterminal shade; a terminal series of black points. Hind wing white irrorated with a few black scales; a diffused pale olive antemedial line; a black discoidal point; a diffused oblique pale olive medial band; a diffused waved pale olive postmedial band and waved subterminal shade; a terminal series of black points; the underside white with black discoidal point and terminal series of points.

Hab. N.E. Rhodesia, Chambezi valley (*Neave*), 1 ♂, 2 ♀ type; Mashonaland, Salisbury (*Marshall*), 3 ♂, 3 ♀. *Exp.* 20–26 mm.

CRASPEDIA SINCERA Warr. Nov. Zool. viii. p. 208 (1901).

N.E. RHODESIA, E. Luangwa distr.

CRASPEDIA ARGYROLEUCA, sp. n. (Pl. XXXIX. fig. 35.)

Head, thorax, and abdomen white tinged in parts with brown and slightly irrorated with black; palpi at tips and frons black; neck reddish brown; legs tinged with reddish brown, the fore legs blackish in front. Fore wing silvery white irrorated with a few black scales, the costa tinged with reddish brown; a faint sinuous brown medial line; postmedial line reddish brown, oblique, waved; a terminal series of prominent black points. Hind wing silvery white sparsely irrorated with black scales; a black discoidal point, waved brown postmedial line, and terminal series of black points; the underside silvery white with terminal series of black points.

Hab. BR. E. AFRICA, Mtebe (*Ansorge*), 1 ♀; N.W. RHODESIA, Alala plateau (*Neave*), 1 ♂ type. *Exp.* 30 mm.

CRASPEDIA LÆVIPENNIS Warr. Nov. Zool. iv. p. 52 (1897).

N.W. RHODESIA, Alala plateau.

CRASPEDIA INTERNATARIA Wlk. xxii. 746 (1861).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley, Chinsali distr.

CRASPEDIA SPOLIATA Wlk. xxii. 744 (1861).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley, Chinsali distr., Lake Bangweolo distr., Tanganyika plateau.

CRASPEDIA LACTARIA Wlk. xxvi. 744 (1861).

N.E. RHODESIA, E. Luangwa distr., upper Luangwa valley, Kalungwisi Valley, Lake Bangweolo distr.

CRASPEDIA OPICATA Fabr. Ent. Syst. Suppl. p. 457 (1794).

N.E. RHODESIA, E. Luangwa distr.

LARENTIANÆ.

STERRHA SACRARIA Linn. Syst. Nat. i. (2) p. 863 (1759).

CONGO, Katanga, Kambove; N.E. RHODESIA, Luangwa valley, Chambezi valley, Kalungwisi valley, Chinsali distr., Mansya R.; PORTUGUESE E. AFRICA, S. Angoniland.

ŒNOCHROMINÆ.

AFROPHYLA VETHI Snell. Tijd. v. Ent. xxix. p. 139 (1886).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

ORTHOSTIXINÆ.

ALEX CONSOCITARIA Wlk. xxxiii. 986 (1861).

N.W. RHODESIA, Kapopo; N.E. RHODESIA, Luangwa valley, Chambezi valley, Kalungwisi valley, Lake Bangweolo distr., Tanganyika plateau, Mansya R.

OZOLA PULVERULENTA Warr. Nov. Zool. iv. p. 30 (1897).

N.E. RHODESIA, Luangwa valley.

SATURNIADÆ.

NUDAURELIA ZAMBESINA Wlk. xxxii. 523 (1865).

N.E. RHODESIA, E. Luangwa distr.

NUDAURELIA JACKSONI Roths. Nov. Zool. xv. p. 255 (1908).

N.W. RHODESIA, Alala plateau.

COPAXA DENTIFERA Mssn. Beitr. Schmett. v. f. 115 (1886).

N.E. RHODESIA, E. Luangwa distr.

COPAXA HANNINGTONI Butl. A. M. N. H. (5) xii. p. 106 (1883).

N.E. RHODESIA, E. Luangwa distr.

IMBRASIA EPIMETHEA Drury, Ill. Exot. Ent. ii. pl. 13. f. 1 (1773).

CONGO, Katanga, Kambove.

GONIMBRASIA PYGMÆA Mssn. Beitr. Schmett. v. f. 100 (1886).

N.E. RHODESIA, E. Luangwa distr.

GONIMBRASIA IRIUS Fabr. Ent. Syst. iii. (1) p. 409 (1793).

CONGO, Katanga, Kambove.

GONIMBRASIA TYRRHENA Westw. Proc. Zool. Soc. 1849, p. 51.

N.E. RHODESIA, E. Luangwa distr.

GYNANISA MAIA Klug, Neue Schmett. pl. 5. f. 1 (1836).

CONGO, Katanga, Kambove.

GYNANISA ISIS Westw. Nat. Libr., Exot. Moths, p. 138, pl. 13 (1841).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, upper Luangwa valley.

PSEUDAPHELIA APOLLINARIS Boisd. Delegorgue's Voy. Afr. Austr. ii. p. 601 (1847).

N.W. RHODESIA, Kansanshi.

GOODIA KUNZEI Dewitz, Verh. Leop.-Carol. Akad. xliii. p. 70, pl. iii. f. 14 (1881).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr.

CARNEGIA PANCRATIA Weym. Iris, xvi. p. 232, pl. ii. f. 8 (1903)

N.E. RHODESIA, E. Luangwa distr., Petauke distr.

HENUCHA DELEGORGUEI Boisd. Delegorgue's Voy. Afr. Austr. ii. p. 601 (1847).

CONGO, S.E. Katanga.

SABALIADÆ.

SABALIA FULVICINCTA Hmpsn. Trans. Ent. Soc. 1901, p. 167.

CONGO, Katanga, Kambove.

URANIADÆ.

ACROPTERIS ALBIDIORATA Mab. Ann. Soc. Ent. Belg. xxxvii p. 62 (1893).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Kalungwisi distr.

ACROPTERIS ANGULATARIA Fabr. Ent. Syst. iii. 2, p. 164 (1794).

CONGO, Katanga, Kambove.

ACROPTERIS TENELLA Wlk. Pr. Nat. Hist. Soc. Glasg. i. p. 377 (1869).

N.E. RHODESIA, Luangwa valley.

ACROPTERIS ILLITURATA Warr. Nov. Zool. iv. p. 198 (1897).

N.E. RHODESIA, upper Luangwa valley.

ARBELIDÆ.

MARSHALLIANA BIVITTATA Auriv. Ent. Tidskr. 1901, p. 126.

CONGO, S.E. Katanga.

COSSIDÆ.

AZYGOPHLEPS INCLUSA Wlk. vii. 1534 (1856).

CONGO, S.E. Katanga.

AZYGOPHLEPS ATRIFASCIATA, sp. n. (Pl. XXXIX. fig. 20.)

♀. Head and thorax creamy white; palpi blackish except at base; frons rufous with lateral blackish bars; antennæ black; tegulæ with black patch at middle with two broad subdorsal fasciæ with some leaden-grey scales mixed extending from it to metathorax; pectus with sublateral blackish fasciæ; tibiæ above and the tarsi black with a bluish gloss; abdomen white with lateral fuscous bands and blackish lateral fasciæ on the elongate anal somite, the ventral surface suffused with yellow-brown. Fore wing creamy white reticulated with orange; a black fascia on costal area from near base, broadening to before apex where it narrows to a point, its lower edge rather irregular; a broad black fascia below the cell from near base, expanding beyond the cell to termen above vein 5 and leaving some pale marks on termen below vein 5, its upper edge irregular; slight black spots on termen at veins 7, 6; cilia tinged with fuscous except at base. Hind wing white with fuscous-brown streak in submedian fold from near base and fuscous suffusion between veins 5 and 2; vein 7 streaked with fuscous brown towards apex; the underside with fuscous suffusion on costal area, narrowing to base, and some fuscous suffusion on termen between veins 5 and 2.

Hab. N.E. RHODESIA, Kalungwisi distr. (*Neave*), 1 ♀ type. *Exp.* 80 mm.

CHALCIDICA STEPHANIA Druce, P. Z. S. 1887, p. 685, pl. 55. f. 3 (1888).

N.E. RHODESIA, E. Luangwa distr.

LASIOCAMPIDÆ.

PSEUDOMETA CYMOGRAPHA, sp. n. (Pl. XXXIX. fig. 18.)

♂. Head and thorax grey, tinged with ochreous and slightly irrorated with brown; abdomen grey tinged with brown; palpi, pectus, legs, and ventral surface of abdomen more strongly irrorated with brown. Fore wing grey slightly irrorated with brown; traces of a sinuous antemedial line formed of brown striæ from below costa to inner margin; postmedial line red-brown, sinuous from costa to vein 6, then waved and oblique to submedian fold and bent outwards to inner margin, some red-brown suffusion beyond it on inner area; the veins of terminal area with faint pale streaks; cilia dark brown at tips. Hind wing grey suffused with red-brown, the veins beyond the cell with faint pale streaks; a double minutely waved sinuous postmedial line; cilia dark brown at tips; the underside with red-brown suffusion on disk, a subterminal red-brown bar between veins 3 and 2.

Hab. N.E. RHODESIA, Feira (*Neave*), 1 ♂ type. *Exp.* 50 mm.

GONOMETA GRISEOCINCTA, sp. n. (Pl. XL. fig. 15.)

♂. Head, thorax, and abdomen purple-brown tinged with grey. Fore wing purple-brown suffused with grey; antemedial line purple-brown, double, sinuous; a small elliptical black discoidal spot; postmedial line purple-brown, double, diffused, slightly incurved below costa and oblique below vein 4; the terminal area browner, with a lunulate grey subterminal line and some grey on termen; cilia chocolate-red. Hind wing with the base purplish brown suffused with grey, the disk deep chocolate-red; a terminal grey band; cilia chocolate-red at tips.

Hab. N.E. RHODESIA, Serenji distr. (*Neave*), 1 ♂ type. *Exp.* 90 mm.

GONOMETA DRUCEI Beth.-Baker, A. M. N. H. (8) ii. p. 260 (1908). (Pl. XLI. fig. 16.)

N.E. RHODESIA, Chinsali distr.

CRASPIA WAHLBERGI Auriv. Ark. f. Zool. v. 5, p. 20 (1909).

N.E. RHODESIA, E. Luangwa distr.

METANASTRIA PALLENS Beth.-Baker, A. M. N. H. (8) ii. p. 260 (1908).

N.E. RHODESIA, E. Luangwa distr.

PHILOTHERMA FUSCESCENS, sp. n. (Pl. XLI. fig. 15.)

♂. Head and thorax grey tinged with brown, the branches of antennæ rufous; abdomen grey tinged with reddish brown, a dark brown lateral line. Fore wing grey suffused with fuscous brown; an indistinct fuscous antemedial line, slightly incurved at subcostal nervure, then obliquely excurved; a small pale discoidal spot; postmedial line fuscous, excurved below costa, then oblique; an oblique subterminal series of dentate blackish marks, bent inwards to costa, somewhat incurved at vein 5 and angled outwards at vein 3. Hind wing grey suffused with fuscous brown; traces of a diffused sinuous medial fuscous band; a subterminal series of rather diffused fuscous dentate marks; cilia fuscous; the underside with the markings less distinct.

Hab. CONGO, S.E. Katanga (*Neave*), 1 ♂ type. *Exp.* 92 mm.

PHILOTHERMA SORDIDA Auriv. Trans. Ent. Soc. 1905, p. 318, pl. 16. f. 2.

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Kalungwisi distr.

LENODORA NIGROLINEATA Auriv. Ent. Tidskr. xvi. p. 115 (1890).

N.E. RHODESIA, Fort Jameson.

BOMBYCOPSIS VENOSA Butl. P. Z. S. 1895, p. 269, pl. xvi. f. 6.

N.E. RHODESIA, Chambezi valley.

CERATOPACHA GEMMATA Dist. A. M. N. H. (6) xx. p. 207 (1897).

N.E. RHODESIA, Luangwa valley.

CHRYSOPOLOMIDÆ.

CHRYSOPOLOMA ROSEA Druce, P. Z. S. 1886, p. 410, pl. 38. f. 3.

N.E. RHODESIA, E. Luangwa distr.

CHRYSOPOLOMA ALBIDISCALIS, sp. n. (Pl. XL. fig. 14.)

♀. Head fulvous; antennæ black; thorax ochreous white, the patagia tinged with fulvous; the fore legs and tarsi fulvous; abdomen ochreous white with segmental fulvous rings, except on ventral surface. Fore wing ochreous white tinged with rufous, the veins of terminal half more fulvous; a round white discoidal spot; postmedial line dark brown, slightly bent inwards to costa, rather oblique to vein 6, then inwardly oblique and somewhat crenulate; cilia rufous. Hind wing ochreous white; a slightly waved excurved brown postmedial line from below costa to inner margin, the veins beyond it streaked with fulvous; cilia rufous; the underside with the postmedial line somewhat dentate, the terminal area tinged with rufous.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀ type. *Exp.* 78 mm.

CHRYSOPOLOMA INSPERSA, sp. n. (Pl. XL. fig. 16.)

♀. Head and front part of thorax grey mixed with dark brown, the hinder part of thorax and antennæ fulvous mixed with some grey; abdomen fulvous, with some dark scales; pectus, legs, and ventral surface of abdomen grey mixed with dark brown. Fore wing fulvous irrorated with fuscous, the costa suffused with grey; a small white discoidal spot defined by black; an oblique blackish postmedial line slightly bent outwards to costa; cilia grey tinged with fuscous. Hind wing fulvous, sparsely irrorated with fuscous except on costal area; a small blackish discoidal lunule; postmedial line blackish, oblique, obsolescent towards costa and slightly bent outwards to inner margin; cilia grey mixed with fuscous; the underside greyer, thickly irrorated with fuscous and with a few hairy white scales, the discoidal lunule with slight white centre, the postmedial line reaching the costa but not the inner margin.

Hab. CONGO, S.E. Katanga (*Neave*), 1 ♀ type. *Exp.* 46 mm.

LIMACODIDÆ.

SUSICA PYROCAUSTA, sp. n. (Pl. XXXIX. fig. 10.)

♂. Head, thorax, and abdomen ochreous tinged with rufous and mixed with black. Fore wing purplish red, the costa ochreous irrorated with black; a diffused curved black antemedial band from middle of cell to inner margin; two conjoined black discoidal points; postmedial line grey-white, oblique, defined on outer side by black suffusion except towards costa and on inner side slightly by black from lower angle of cell to inner margin; cilia ochreous white mixed with black and with ochreous-white lines near base and tips. Hind wing ochreous white, the inner margin tinged with rufous, the cilia with fuscous mixed; the underside ochreous tinged with rufous, the terminal area slightly irrorated with fuscous.

♀. Hind wing dark reddish brown, with a pale line at base of cilia.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♂ type; MASHONALAND (*Dobbie*), 1 ♂, 1 ♀, Salisbury (*Marshall*), 1 ♂; TRANSVAAL (*Pead*), 1 ♀. *Exp.* 28–34 mm.

THOSEA CATORI Beth.-Baker, A. M. N. H. (8) ii. p. 257 (1908).

CONGO, S.E. Katanga, Kambove.

MIRESA SEMICALIDA, sp. n. (Pl. XXXIX. fig. 21.)

♂. Head and thorax deep chestnut-red; abdomen rather paler, with slight fuscous segmental lines; the tibial spurs whitish. Fore wing deep chestnut-red to the silvery-white postmedial line, which is excurved at vein 6, incurved at discal fold, dentate below veins 4 and 3, then retracted to before middle, and again slightly excurved at vein 1, the area beyond it suffused with leaden fuscous bounded by a series of slight pale spots bent inwards to the postmedial line below costa; the terminal area dull rufous. Hind wing yellowish suffused with rufous; the cilia rufous with a silvery gloss at tips; the underside with the costal area deep rufous.

Hab. CONGO, S.E. Katanga (*Neave*), 6 ♂ type; N.E. RHODESIA, Lukashashi R. (*Neave*), 1 ♂. *Exp.* 30 mm.

MIRESA USTITERMINA, sp. n. (Pl. XXXIX. fig. 11.)

♂. Head, thorax, and abdomen dark brown mixed with some red. Fore wing glossy fuscous brown, the base tinged with red, the terminal area deep fiery red, its inner edge curved; cilia glossy fuscous brown. Hind wing pale greyish brown, the cilia with a leaden gloss at tips; the underside rather darker grey-brown slightly irrorated with fuscous.

Hab. CONGO, S.E. Katanga (*Neave*), 2 ♂ type. *Exp.* 26 mm.

PARASA VIVIDA Wlk. xxxii. 478 (1865).

N.E. RHODESIA, E. Luangwa distr.

MACROPLECTRA RUFOPALLENS, sp. n. (Pl. XXXIX. fig. 16.)

Head and tegulæ ochreous tinged with rufous; thorax and abdomen ochreous white; antennæ with the shaft whitish; pectus, legs, and ventral surface of abdomen tinged with rufous. Fore wing silky ochreous white tinged with rufous except on inner area; a faint brownish subterminal line ending at tornus. Hind wing uniform silky ochreous white. Underside of fore wing suffused with brown except on inner area.

Hab. UGANDA, White Nile, Gondokoro (*Reynes-Cole*), 7 ♂, 1 ♀;

Br. E. Africa, Machakos (*Crawshay*), 4 ♂ type; N.E. Rhodesia, upper Luangwa valley (*Neave*), 1 ♂; Gazaland, Mt. Chirinda (*Marshall*), 1 ♂. *Exp.*, ♂ 16–20, ♀ 18 mm.

Gavara velutina Wlk. xii. 771 (1857).

N.E. Rhodesia, Fort Jameson.

Zinara discophora, sp. n. (Pl. XXXIX. fig. 22.)

♂. Head, thorax, and abdomen ochreous tinged with rufous and mixed with blackish. Fore wing ochreous suffused with brown and irrorated with blackish; a black line from subcostal nervure near base curved round to just above inner margin, then upwards to subcostal nervure before middle, enclosing a round pale patch; the inner medial area rufous, with an oblique sinuous whitish line from lower angle of cell to inner margin, some slight black marks above it on discocellulars, and a black point beyond it in submedian fold; postmedial line indistinct, pale, slightly excurved below costa, then incurved, a rufous patch beyond it on costal area with three slight dentate black marks on it; the apical area pale, with a black-brown terminal band from apex to vein 5, angled inwards and forming a triangular patch at vein 6. Hind wing ochreous whitish suffused with reddish brown; a faint oblique brown line from below middle of costa to termen at submedian fold; a slight brownish terminal line; the underside grey tinged with brown and slightly irrorated with fuscous.

Hab. N.E. Rhodesia, Chinsali distr. (*Neave*). 1 ♂ type. *Exp.* 20 mm.

Altha lacides Druce, A. M. N. H. (7) iii. p. 474 (1899). (Pl. XXXIX. fig. 17.)

Congo, S.E. Katanga.

Altha tegula Dist. A. M. N. H. (6) xx. p. 209 (1897). (Pl. XLI. fig. 29.)

N.E. Rhodesia, Bangweolo distr.

Altha chionostola, sp. n. (Pl. XXXIX. fig. 28.)

Head, thorax, and abdomen silvery white, the branches of antennæ and disk of tegulæ tinged with yellow; palpi with the second joint fuscous above; tarsi tinged with fuscous; abdomen with blackish lateral bars. Fore wing silvery white; a broad olive-fuscous fascia with some silvery scales on it running inwards from termen just below apex to below middle of costa, then as an erect band to inner margin, an oblique black striga on its outer edge at lower angle of cell, slight black streaks on extremity of the veins at apex, and a black line on apical part of termen; cilia blackish at tips at apex. Hind wing silvery white.

Hab. Congo, S.E. Katanga (*Neave*), 1 ♀ type; Transvaal, Barberton (*Cooke*), 1 ♂. *Exp.* 36 mm.

ZYGÆNIDÆ.

HIMANTOPTERINÆ.

SEMIOPTILA TORTA, Butl. A. M. N. H. (5) xx. p. 181 (1887).

CONGO, Katanga, Kambove.

SEMIOPTILA FLAVIDISCATA, sp. n. (Pl. XXXIX. fig. 27.)

♂. Head and thorax black-brown, the tegulæ and fringe of hair on upper edge of patagia fulvous orange; abdomen dorsally red-brown, yellow at sides and black-brown below. Fore wing dark brown, thinly scaled, the veins darker; the cell fulvous yellow, conjoined to a round spot beyond it; the inner area fulvous yellow to the cell and vein 2. Hind wing linear-lanceolate, expanding somewhat towards base but not towards extremity; the basal third fulvous yellow, the terminal two-thirds black-brown.

♀. Fore wing with the cell and inner area paler fulvous yellow; hind wing expanding still less towards base, the basal third pale fulvous yellow.

Hab. N.E. RHODESIA, Serenji distr. (*Neave*), 1 ♂, 1 ♀ type. *Exp.* 24 mm.

STAPHYLINOCHROUS WHYTEI Butl. P. Z. S. 1893, p. 376, pl. 60. f. 11.

CONGO, Katanga, Kambove.

STAPHYLINOCHROUS FULVA, sp. n. (Pl. XL. fig. 10.)

♂. Head and thorax black, with some fulvous hair on tegulæ and patagia; legs with some yellowish hair; abdomen fulvous mixed with brown. Fore wing fulvous red, the median nervure, veins rising from it and vein 1 somewhat blackish; the terminal area black-brown, expanding towards apex and with its inner edge evenly curved. Hind wing fulvous red; the terminal area black-brown, expanding somewhat towards apex, its inner edge curved and produced to slight streaks on the veins.

Hab. CONGO, Katanga, Kambove (*Neave*), 3 ♂ type. *Exp.* 42 mm.

STAPHYLINOCHROUS EURYPERALIS, sp. n. (Pl. XL. fig. 17.)

Head and front of thorax fulvous, the rest of thorax and antennæ black; pectus and legs fulvous mixed with brown; abdomen fulvous, dorsally tinged with brown. Fore wing fulvous yellow, the veins streaked with dark brown; the terminal area fuscous brown, expanding into a rounded patch extending to the cell on apical area and narrowing to a point at tornus. Hind wing fulvous yellow, the veins beyond the cell brownish; the terminal area fuscous brown, moderately broad at apex, narrowing to a point at tornus.

Hab. BR. C. AFRICA, Matope (*de Jersey*), 1 ♂; N.E. RHODESIA Luangwa valley (*Neave*), 2 ♂ type. *Exp.* 34–36 mm.

Genus THERMOCHROUS, nov.

Type, *T. fumicincta.*

Proboscis and palpi absent; frons smooth; eyes rather small, round; antennæ of male moniliform, setose; head, thorax, and abdomen clothed with rough hair; tibiæ without spurs. Fore wing rather narrow, the apex rounded, the termen obliquely curved; the cell very long; vein 3 from long before angle; 5 from just below angle of discocellulars, 6 from just above angle; 7, 8 from angle or stalked; 9, 10 absent; 11 free. Hind wing with the cell long; vein 3 from long before angle, 5 from well above angle; 6 from just above angle of discocellulars; 8 from just before end of cell.

THERMOCHROUS FUMICINCTA, sp. n. (Pl. XL. fig. 11.)

Fore wing with veins 7, 8 from cell.

Head, thorax, and abdomen fulvous; antennæ black-brown; legs tinged with brown in front. Fore wing fulvous red, the costal edge and veins of terminal half dark brown; the terminal area bluish fuscous, narrowing to a point at tornus and expanding on apical area to the cell and along costa to middle. Hind wing fulvous red, the terminal area bluish fuscous, moderately broad at costa and ending in a point at vein 1, its inner edge produced to slight streaks on the veins.

Hab. CONGO, Katanga, Kambove (*Neave*), 25 ♂, 3 ♀ type. *Exp.* 30–40 mm.

THERMOCHROUS STENOCRASPIS, sp. n. (Pl. XL. fig. 18.)

Fore wing with veins 7, 8 from cell.

♂. Head, thorax, and abdomen fulvous with some blackish hair; antennæ and legs brownish. Fore wing fulvous yellow, the costa and veins streaked with black, vein 1 *c* towards extremity only; the costal area blackish on terminal half, the veins of terminal area more strongly streaked with black on apical half; cilia blackish except towards tornus. Hind wing fulvous yellow, the veins of terminal area streaked with black, the termen narrowly and cilia blackish.

Hab. N.E. RHODESIA, E. Luangwa distr., Petauke (*Neave*), 7 ♂ type. *Exp.* 22–26 mm.

ZYGÆNINÆ.

NEUROSYMPLOCA PROCRIOIDES Butl. P. Z. S. 1893, p. 676.

N.E. RHODESIA, upper Luangwa valley.

MALAMBLIA FLAVIPALPIS, sp. n. (Pl. XL. fig. 12.)

♀. Head, thorax, and abdomen fuscous brown; palpi pale yellow, the third joint black; mid and hind legs with the extremities of femora and base of tibiæ yellow; abdomen yellow at extremity below. Wings uniform fuscous brown tinged with metallic blue.

Hab. N.E. RHODESIA, Tanganyika plateau (*Neave*), 1 ♀ type. *Exp.* 18 mm.

SALIUNCA GLENNIA Jord. Entom. xl. p. 123 (1897).

N.E. RHODESIA, E. Luangwa distr.

POMPOSTOLINÆ.

POMPOSTOLA HEMICHRYSA, sp. n. (Pl. XL. fig. 13.)

♀. Head and thorax bluish black; the tegulæ, patagia, and mid tibiæ except at extremity golden yellow; abdomen blue-black, the sides golden yellow to middle. Fore wing golden yellow to beyond middle with a short black streak in base of cell, the outer edge of the yellow area angled outwards just beyond lower angle of cell; the terminal area blue-black. Hind wing golden yellow, the terminal area black-brown, broad at costa and narrowing to a point at vein 1.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 3 ♀ type. *Exp.* 36 mm.

POMPOSTOLA SCINTILLANS Butl. P. Z. S. 1893, p. 675, pl. ix. ff. 12-13.

N.E. RHODESIA, Serenji distr.

[This species frequents open grassy spots and invariably rests with partially expanded wings on the heads of grasses or similarly exposed positions. Its shining blue-black colour, steady flight, and long hind legs trailing behind it combine to make it astonishingly like a Hymenopteron when on the wing.

I also noted it in some numbers in Southern Angoniland, S.W. of L. Nyasa, in similar country, December 1908.—S. A. N.]

BYBLISIA CAUDATA Jord. Entom. xl. p. 127 (1907).

N.E. RHODESIA, Luangwa valley.

ARNIOCERA CHALCOPASTA, sp. n. (Pl. XL. fig. 19.)

♂. Head, thorax, and abdomen black suffused with brilliant metallic blue; palpi and fore coxæ deep crimson. Fore wing black suffused with brilliant metallic blue; antemedial, medial, and postmedial erect metallic golden bands, the terminal area suffused with metallic gold. Hind wing dark brown; the inner area tinged with metallic blue not extending to tornus; the underside suffused with metallic blue except towards apex.

Hab. N.E. RHODESIA, Tanganyika plateau (*Neave*), 1 ♂ type. *Exp.* 32 mm.

THYRIDIDÆ.

RHODONEURA FUSCIBASIS, sp. n. (Pl. XL. fig. 20.)

♂. Head and thorax dark olive-brown mixed with some silvery white; mid and hind legs mostly white; abdomen white with obscure olive dorsal bands. Fore wing with the basal area dark olive-brown with obliquely curved outer edge; the rest of wing white; the costa tinged with fuscous and irrorated with silver; a white striga defined by fuscous across upper extremity of cell; a diffused leaden fuscous band from the costal area beyond the cell to just above inner margin, its inner edge incurved below the cell and with double series of dark striæ on it representing the medial and postmedial lines, some white between them in submedian interspace and on the postmedial line beyond the cell; an olive-brown patch before termen at discal fold, with traces of a line from it to inner margin and some fuscous beyond it; two black points just before termen below apex. Hind wing silvery white, the extreme base olive-brown; traces of medial and postmedial grey bands defined on each side by dark striæ from below costa to inner margin; a faint olive subterminal line from below costa to vein 4 and two black points just before termen below apex.

♀. Fore wing with the dark medial and subterminal markings more developed.

Hab. Congo, Katanga, Kambove (*Neave*), 3 ♂, 2 ♀ type. *Exp.* 28–36 mm.

Rhodoneura discata Warr. Nov. Zool. xii. p. 380 (1905). (Pl. XLI. fig. 25.)

N.E. Rhodesia, Chambezi valley.

PYRALIDÆ.

Crambinæ.

Crambus fuscivittalis, sp. n. (Pl. XL. fig. 1.)

♀. Head and thorax brownish ochreous, the shoulders and tegulæ dark brown; antennæ black; palpi at tips and fore legs in front dark brown; abdomen white tinged with brown. Fore wing brownish ochreous with a brown fascia along median nervure expanding triangularly beyond the cell to termen at apex and submedian fold; a terminal series of slight blackish striæ; cilia with fine whitish lines at base and middle. Hind wing silky white with a very faint brownish tinge.

Hab. N.E. Rhodesia, Serenji distr. (*Neave*), 1 ♀ type. *Exp.* 26 mm.

Crambus sectitermina, sp. n. (Pl. XL. fig. 2.)

Fore wing with vein 11 becoming coincident with 12.

♀. Head, thorax, and abdomen white tinged with brown; palpi brown at base. Fore wing white slightly tinged with rufous on basal, costal, and inner areas, the terminal area irrorated with brown at apex and below vein 4; a blackish streak in base of submedian fold; a minute postmedial black point in discal fold with traces of an oblique line from it to inner margin; a faint fulvous subterminal line; the interspaces with minute black streaks in their extremities; cilia with a slight blackish line near base. Hind wing white faintly tinged with ochreous brown; a fine brown terminal line; cilia white.

Hab. N.E. RHODESIA, E. Luangwa distr., Mbala country (*Neave*), 1 ♀ type. *Exp.* 28 mm.

PLATYTES ARGYRODONTA, sp. n. (Pl. XL. fig. 3.)

Head and thorax rufous mixed with silvery white; abdomen white slightly tinged with rufous at base. Fore wing rufous; a silvery-white fascia below costa through the cell, beyond which it is trifurcate, the teeth defined by blackish, the uppermost tooth extending to nearest termen; a silvery-white fascia below submedian fold extending to near termen towards which it bifurcates, an obliquely curved silvery-white streak from vein 3 just before termen running inwards between its teeth; an oblique silvery-white streak across apical area; two yellowish-white marks extending between the lower teeth of the trifurcate fascia; a fine black terminal line defined on inner side by a white line; cilia white with some dark brown at tips. Hind wing white faintly tinged with brown.

Hab. N.W. RHODESIA, Alala plateau, Mkushi distr. (*Neave*), 1 ♂, 1 ♀ type. *Exp.* 26 mm.

CHILO SUPPRESALIS Wlk. xxvii. 166 (1863).

PORTUGUESE E. AFRICA, Chinde.

CHILO FUSCICILIA, sp. n. (Pl. XL. fig. 4.)

♀. Head and thorax ochreous tinged with rufous; abdomen ochreous white dorsally tinged with rufous at base. Fore wing ochreous suffused with rufous, the veins with slight whitish streaks, the interspaces of terminal area with faint dark streaks; a black discoidal point; a terminal series of black points; cilia fuscous except at base. Hind wing white faintly tinged with rufous; the underside with the costal area more strongly tinged with rufous.

Hab. N.E. RHODESIA, Bangweolo distr. (*Neave*), 1 ♀ type. *Exp.* 34 mm.

TALIS NIGRORADIANS Mab. Ann. Soc. Ent. Fr. xlviii. p. 749 (1900).

CONGO, S.E. Katanga, Kambove.

CHARLTONA CHRYSOPASTA, sp. n. (Pl. XL. fig. 5.)

♀. Head and thorax white mixed with metallic golden scales and irrorated with black; palpi blackish; tarsi black ringed with white; abdomen white mixed with brown. Fore wing white thickly irrorated with metallic golden and black scales; an ill-defined white fascia below base of cell; medial line double, black filled in with white, slightly excurved at middle; a white discoidal lunule defined by black; a diffused white fascia from it to termen; a terminal series of small rather elongate black spots, the uppermost with a black streak from it to upper extremity of discoidal lunule; cilia blackish. Hind wing whitish suffused with brown, the cilia silvery white.

Hab. N.E. RHODESIA, upper Luangwa valley (*Neave*), 1 ♀ type. *Exp.* 22 mm.

CHARLTONA PLURIVITTALIS, sp. n. (Pl. XL. fig. 6.)

♀. Head and thorax pale ochreous suffused with brown and strongly irrorated with black; abdomen ochreous white. Fore wing ochreous, the interspaces filled by black fasciæ formed by very thick irroration. Hind wing white tinged with fuscous except towards base, the cilia white.

Hab. CONGO, S.E. Katanga (*Neave*), 1 ♀; MASHONALAND, Salisbury (*Marshall*), 9 ♀ type. *Exp.* 44–50 mm.

ANCYLOLOMIA CHRYSOGRAPHELLA Koll. Hüg. Kasch. iv. p. 494 (1844).

CONGO, S.E. Katanga.

ANCYLOLOMIA PECTINIFERA, sp. n. (Pl. XL. fig. 7.)

Antennæ of male with long uniseriate branches.

♂. Head and thorax rufous mixed with some whitish; antennæ with the shaft dark brown; legs suffused with brown; abdomen white suffused with brown except at extremity. Fore wing whitish suffused with golden bronze in, below, and just beyond the cell with minute scattered black streaks on this area; the costal edge dark brown; the veins slightly streaked with brown, the median nervure defined by slight white streaks; the interspaces of terminal area with brown streaks with white streaks between them, before the subterminal line, which is blackish with a fine brown line before it and fuscous line beyond it, bent outwards to apex, then minutely waved, angled outwards at vein 4 where the fuscous line is interrupted; a black terminal line; cilia silvery white with black line near tips. Hind wing white suffused with fuscous brown, the cilia silvery white; some white in base of cell, on inner margin, and termen.

♀. Fore wing with ill-defined black-irrorated bronze streaks in cell and submedian fold from near base to termen, the veins and interspaces without dark streaks, the subterminal line obsolete except towards apex; a terminal series of black points.

Hab. N.W. RHODESIA, Alala plateau (*Neave*), 1 ♀; N.E. RHODESIA, Chinsali distr. (*Neave*), 1 ♂ type; MASHONALAND, Salisbury (*Marshall*), 2 ♂; NATAL, Estcourt (*Hutchinson*), 2 ♂. *Exp.* ♂ 28–36, ♀ 42 mm.

ANCYLOLOMIA ENDOPHÆALIS, sp. n. (Pl. XL. fig. 8.)

♀. Head and thorax fuscous brown mixed with greyish;

abdomen whitish tinged with brown and with fulvous at base. Fore wing ochreous with a fulvous tinge, the inner area suffused with fuscous brown; a dark streak irrorated with black from just before lower angle of cell, where it is interrupted, to some fuscous-brown suffusion on termen extending from apex to vein 4; some black irroration above middle of vein 1 and in submedian fold below end of cell; a terminal series of black points; cilia silvery at tips from apex to vein 4. Hind wing white suffused with brown except on inner area; cilia white.

Hab. CONGO, S.E. Katanga (*Neave*), 1 ♀ type. *Exp.* 34 mm.

SCHŒNOBIANÆ.

SCIRPOPHAGA GILVIBERBIS Zell. Mon. Chil. & Cramb. p. 2 (1863).

CONGO, S.E. Katanga; N.E. RHODESIA, upper Luangwa valley, Chinsali distr.

BRIHASPA CHRYSOSTOMA Zell. Lep. Micr. Caffr. p. 68 (1852).

N.E. RHODESIA, E. Luangwa distr.

ANERASTIANÆ.

PECTINIGERIA DEVYLDERI Rag. Nouv. Gen. p. 43 (1888); Rom. Mém. viii. p. 354, pl. xxxvii. f. 10.

N.W. RHODESIA, Alala plateau.

PECTINIGERIA NIGRITELLA Rag. Rom. Mém. viii. p. 354, pl. xxxvii. f. 13 (1901).

N.W. RHODESIA, Alala plateau.

POLYOCHA (LODIANA) SANGUIFUSALIS, sp. n. (Pl. XL. fig. 9.)

Antennæ of male minutely serrate, the shaft excised at base, then thickened with a ridge of black scales above; palpi porrect, hollowed out to contain the brush-like maxillary palpi.

Head and thorax rufous with a yellowish streak on vertex and tegulæ; palpi and fore legs suffused with dark brown; abdomen ochreous tinged with reddish brown. Fore wing yellow, the costa whitish with a dark brown streak below it; diffused blood-red fasciæ below base of cell and on inner margin which has some brown on it beyond middle; an oblique blood-red patch at middle of submedian interspace with some silvery scales on it; a red streak below terminal half of the brown subcostal fascia emitting a tooth at discocellulars; a postmedial red bar with some silvery scales on it from vein 4 to the red inner area; termen and cilia red. Hind wing grey-white, the veins, costal, and terminal areas suffused with brown; cilia whitish with a brown line near base.

Hab. N.E. RHODESIA, Chinsali distr. (*Neave*), 3 ♂, 1 ♀ type. *Exp.* 28 mm.

PHYCITINÆ.

POGONONEURA XANTHOLEPIS, sp. n. (Pl. XL. fig. 21.)

Antennæ of male with the tuft of scales in sinus very large; fore wing with the costal edge fringed with yellow scales on basal half.

♂. Head, thorax, and abdomen fuscous mixed with grey; tarsi with slight pale rings. Fore wing grey suffused with fuscous; an antemedial patch of slight dark suffusion on inner margin; faint dark points at angles of cell; postmedial line very indistinct and rather diffused, angled outwards at vein 6, then oblique; traces of a diffused dark subterminal line, angled inwards at vein 6; a terminal series of slight black points and a fine blackish line near base of cilia. Hind wing semihyaline white, the termen tinged with fuscous; a fine black line near base of cilia.

Hab. N.E. RHODESIA, upper Luangwa valley (*Neave*), 1 ♂ type. *Exp.* 22 mm.

MUSSIDIA ALBIPARTALIS, sp. n. (Pl. XL. fig. 26.)

♀. Head, thorax, and abdomen grey tinged with ochreous brown and irrorated with fuscous; palpi whitish except towards tips; abdomen with dorsal and subdorsal blackish marks on second segment. Fore wing grey suffused with brown and irrorated with fuscous, the medial area to submedian fold and the terminal half of costal area whiter; a blackish streak below antemedial part of costa and a blackish streak in submedian fold from base to the antemedial line, which is blackish, rather diffused, and somewhat dentate; a V-shaped blackish mark in end of cell and a dark shade from discocellulars to inner margin; postmedial line very indistinct, dentate to vein 3, then bent inwards and again outwards to inner margin; traces of a subterminal line with slight dark streaks on the veins, bent inwards at vein 2; a terminal series of blackish points. Hind wing semihyaline whitish, the costal area suffused with fuscous, a fuscous terminal line.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀ type. *Exp.* 46 mm.

EPIPASCHIANÆ.

MACALLA MELANOBASIS Hmpsn. A. M. N. H. (7) xvii. p. 139 (1906). (Pl. XLI. fig. 21.)

N.E. RHODESIA, upper Luangwa valley.

CHRYSAUGINÆ.

MACNA HAMPSONI Dist. A. M. N. H. (6) xx. p. 17 (1897). (Pl. XLI. fig. 9.)

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

PYRALINÆ.

BOSTRA THERMIALIS, sp. n. (Pl. XL. fig. 29.)

Antennæ of male bipectinate with short branches, the apex ciliated.

Head and thorax purplish red-brown mixed with grey; tarsi with whitish rings; abdomen fulvous, suffused with brown at base, the ventral surface chocolate-brown. Fore wing purplish red-brown irrorated with grey and with faint dark streaks in submedian fold and the interspaces of terminal half; traces of a pale oblique sinuous antemedial line; some whitish scales forming a slight spot in middle of cell and a discoidal bar; postmedial line formed of whitish points with traces of a curved minutely waved dark line on their outer side; a terminal series of white points; cilia fuscous brown mixed with whitish. Hind wing with the basal half whitish, the terminal half purplish red; a curved dark postmedial line defined on outer side by whitish, obsolescent towards inner margin; cilia whitish with dark lines near base and tips: the underside with the costal and terminal areas suffused with purplish red and irrorated with fuscous.

Hab. N.E. RHODESIA, Serenji distr. (*Neave*), 1 ♂, 1 ♀ type. *Exp.* 40 mm.

BOSTRA PERRUBIDA, sp. n. (Pl. XL. fig. 28.)

Antennæ of male with fasciculate cilia.

♂. Head and thorax deep purplish red mixed with some ochreous white; tarsi ochreous white irrorated with red; abdomen ochreous white irrorated with dark brown. Fore wing deep purplish red irrorated with black and some ochreous white; some ochreous white at base of inner margin; antemedial line ochreous white defined on outer side by blackish, bent inwards to costa, then erect, waved; the medial part of costa with ochreous-white points; postmedial line ochreous white defined on inner side by blackish, dentate, slightly angled inwards at discal fold and incurved below vein 2; a slight blackish terminal line; cilia ochreous white with blackish line near base, the tips tinged with red. Hind wing ochreous irrorated with fuscous, the terminal area suffused with fuscous and some reddish at middle; postmedial line ochreous defined on inner side by fuscous, minutely dentate, obsolete towards costa; a blackish terminal line; cilia ochreous white with blackish line at middle, the tips tinged with red; the underside with the costal and terminal areas suffused with purplish red.

Hab. N.E. RHODESIA, Serenji distr. (*Neave*), 3 ♂ type, Petauke distr. (*Neave*), 1 ♂. *Exp.* 30 mm.

BOSTRA TENEBRALIS Hmpsn. A. M. N. H. (7) xvii. p 348 (1906). (Pl. XLI. fig. 28.)

CONGO, Katanga, Kambove.

BOSTRA FUSCIPENNIS, sp. n. (Pl. XL. fig. 27.)

♀. Head and thorax fuscous brown with a greyish tinge; fore tibiæ and the tarsi paler; abdomen grey suffused with fuscous brown. Fore wing glossy fuscous brown tinged with grey; [illegible] minute whitish [illegible] whitish, incurved [illegible] and [illegible] minutely dentate [illegible] and slight [illegible] whitish with dark line near base [illegible] suffused with fuscous brown, [illegible] slight whitish postmedial line, excurved below vein 5; cilia whitish with brown lines near base and tips. the underside rather darker with the postmedial line more distinct [illegible]

Hab. N.E. RHODESIA, Petauke distr. (*Neave*), 1 ♀ type. *Exp.* 24 mm.

CONSTANTIA AGLOSSALIS Hmpsn. A. M. N. H. (7) xvii. p. 354 (1906). (Pl. XLI. fig. 27.)

PORTUGUESE E. AFRICA, Chinde.

HYDROCAMPINÆ.

ARGYRACTIS PERIOPIS, sp. n. (Pl. XL. fig. 22.)

♂. Head, thorax, and abdomen white tinged with orange yellow. Fore wing orange, the basal area and costal area to beyond middle white, the latter tinged with brown; traces of a brown antemedial line, interrupted at middle and defined on outer side by diffused silvery white; a double curved brown medial line filled in with silvery white and interrupted below costa; an oblique wedge-shaped white postmedial patch defined by brown from costa to vein 4; a silvery-white subterminal band defined by brown from just below costa to vein 4 and a small wedge-shaped spot above tornus; a terminal series of black points; cilia silvery white tinged with brown. Hind wing orange, the basal area white with diffused curved brown subbasal and medial lines with silvery scales on them; a white patch on terminal area from below costa to submedian fold, its basal part irrorated with black and suffused with silver below, followed by two sinuous black lines and four ocellate black spots on termen with slight silver centres and curved black striæ on their inner sides; cilia silvery white tinged with brown, their bases blackish beyond the ocellate spots; the underside brownish white with the ocellate spots as above.

Hab. N.E. RHODESIA, Kalungwisi valley (*Neave*), 1 ♂ type. *Exp.* 14 mm.

ZEBRONIA PHENICE Cram. Pap. Exot. iv. p. 185, pl. 382. f. G (1783).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley; PORTUGUESE E. AFRICA, Nyanji.

PYRAUSTINÆ.

[illegible] CRIBRATA Fabr. Ent. Syst. iii. 2, p. 215 (1794).

N.E. RHODESIA, E. Luangwa distr.

ENTEPHRIA DIAPHANA Cram. Pap. Exot. ii. p. 26, pl. 113. f. G (1779).

N.E. RHODESIA, upper Luangwa valley, Chambezi valley.

ZINCKENIA FASCIALIS Cram. Pap. Exot. iv. p. 236, pl. 398. f. O (1783).

CONGO, Katanga, Kambove; N.E. RHODESIA, upper Luangwa valley, Chinsali distr., Bangweolo distr.

ZINCKENIA PERSPECTALIS Hubn. Schmett. Eur., Pyr. f. 101 (1796).

N.E. RHODESIA, upper Luangwa valley.

MARASMIA TRAPEZALIS Guen. Delt. & Pyr. p. 200 (1854).

N.E. RHODESIA, upper Luangwa valley.

SYNGAMIA ABRUPTALIS Wlk. xvii. 371 (1859).

N.E. RHODESIA, E. Luangwa distr.

BOCCHORIS INSPERSALIS Zell. Lep. Micr. Caffr. p. 33 (1852).

N.E. RHODESIA, Fort Jameson.

NOSOPHORA LATIFERALIS Wlk. xxxiv. 1401 (1865).

N.E. RHODESIA, N. Luangwa, Chambezi valley, Lake Bangweolo distr.

CHALCIDOPTERA RUFILINEALIS, sp. n. (Pl. XL. fig. 23.)

Palpi of male with the third joint clothed with turned-down hair; antennæ with the shaft excised at base.

Head and thorax pale yellow mixed with some rufous; palpi rufous; shoulders with dark brown streaks; patagia rufous on outer edge; abdomen pale yellow dorsally banded with rufous. Fore wing pale yellow, the costa rufous, the veins streaked with pale rufous; a subbasal rufous line from costa to vein 1; antemedial line rufous, oblique from costa to median nervure, then erect; a rufous point in middle of cell and quadrate discoidal spot; postmedial line rufous, minutely waved, oblique from costa to vein 7, excurved to vein 5, then oblique to inner margin at antemedial line and angled inwards at vein 2; terminal area rufous, expanding below vein 4. Hind wing yellowish white, a minutely dentate postmedial rufous line from costa to vein 3; terminal area rufous from apex to vein 2.

Hab. N.E. RHODESIA, Luangwa valley (*Neave*), 2 ♂, 1 ♀ type; NATAL, Durban (*Leigh*), 1 ♀. *Exp.* 24 mm.

CHALCIDOPTERA APPENSALIS Snell. Tijd. v. Ent. xxvii. p. 41, pl. 3. f. 12 (1884).

N.E. RHODESIA, upper Luangwa valley.

FILODES COSTIVITRALIS Guen. Maillard's Réunion, Lép. p. 65 (1862).

CONGO, Katanga, Kambove; N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley, Bangweolo distr.; PORTUGUESE E. AFRICA, S. Angoniland.

PHRYGANODES PIASUSALIS Wlk. xviii. 1725 (1859).

N.E. RHODESIA, E. Luangwa distr., Mpika.

NACOLEIA INDICATA Fabr. Syst. Ent. p. 640 (1775).

PORTUGUESE E. AFRICA, S. Angoniland.

GONIORHYNCHUS GRATALIS Led. Wien. ent. Mon. iv. p. 473, pl. 11. f. 18 (1863).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

SYLEPTA OVIALIS Wlk. xviii. 636 (1859).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

SYLEPTA TORSIPEX Hmpsn. P. Z. S. 1898, p. 715, pl. 49. f. 12.

N.E. RHODESIA, Chambezi valley.

SYLEPTA BUTLERI Dewitz, Verh. Leop.-Carol. Akad. xliii. p. 87, pl. ii. f. 13 (1881).

N.E. RHODESIA, Kalungwisi distr.

SYLEPTA BALTEATA Fabr. Suppl. Ent. Syst. p. 457 (1798).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

SYLEPTA SABINUSALIS Wlk. xviii. 1708 (1859).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley.

SYLEPTA DEROGATA Fabr. Syst. Ent. p. 641 (1775).

N.E. RHODESIA, upper Luangwa valley.

SYLEPTA MEGASTIGMALIS Hmpsn. P.Z.S. 1898, p. 723. (Pl. XLI. fig. 26.)

N.E. RHODESIA, E. Luangwa distr.

LYGROPIA OBRINUSALIS Wlk. xviii. 549 (1859).

N.E. RHODESIA, E. Luangwa distr.

LYGROPIA AMYNTUSALIS Wlk. xviii. 662 (1859).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, Bangweolo distr.; PORTUGUESE E. AFRICA, Chinde.

LYGROPIA ACOSMIALIS Mab. Bull. Soc. Philom. (7) iii. p. 144 (1879).

N.E. RHODESIA, E. Luangwa distr., Chinsali distr.

LYGROPIA ATRINERVALIS, sp. n. (Pl. XL. fig. 24.)

Ochreous white; front of thorax tinged with orange; wings with the basal area tinged with orange; the costa of fore wing and the veins of both wings strongly streaked with black except towards base; cilia black at base, grey at tips.

Hab. N.E. RHODESIA, Luangwa valley, Petauke (*Neave*), 1 ♂ type, Mpeta (*Coryndon*), 1 ♀. *Exp.* 24 mm.

Genus NEOSTEGE, nov.

Type, *N. holoxutha*.

Proboscis fully developed; palpi upturned, the second joint moderately scaled, the third short, blunt; maxillary palpi filiform; frons with pointed conical prominence; antennæ of male ciliated. Fore wing with veins 3 and 5 from near angle of cell; 7 straight and well separated from 8, 9. Hind wing with veins 3, 4, 5 from lower angle of cell; 6, 7 from upper angle; 7 anastomosing with 8.

NEOSTEGE HOLOXUTHA, sp. n. (Pl. XL. fig. 25.)

Uniform orange-yellow; palpi blackish at extremity; antennæ tinged with fuscous; fore femora above, the extremities of tibiæ, and the tarsi blackish; mid femora and tibiæ above blackish; abdomen with the ventral surface blackish. Underside of fore wing with the disk suffused with fuscous.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 3 ♂, 4 ♀ type, Chinsali distr. (*Neave*), 1 ♂; MASHONALAND, Salisbury (*Marshall*), 3 ♀. *Exp.* 30 mm.

GLYPHODES SERICEA Drury, Ill. Exot. Ins. ii. p. 9, pl. 6. f. 1 (1773).

CONGO, Lualaba R.; N.E. RHODESIA, E. Luangwa distr., Mansya R.

GLYPHODES ELEALIS Wlk. xviii. 516 (1859).

N.W. RHODESIA, Alala plateau, Kapopo.

Glyphodes unionalis Hübn. Eur. Schmett., Pyr. f. 132 (1796).

N.E. Rhodesia, upper Luangwa valley.

Glyphodes actorionalis Wlk. xvii. 498 (1859).

N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley, Chambezi valley.

Glyphodes mayottalis Hmpsn. A. M. N. H. (8) i. p. 479 (1908). (Pl. XLI. fig. 22.)

Congo, Katanga, Kambove.

Glyphodes xanthostola, sp. n. (Pl. XLI. fig. 1.)

♂. Head, thorax, and abdomen orange-yellow; frons and vertex of head with black streak; tegulæ and patagia with black streaks not reaching tips; abdomen with black subdorsal streaks except towards extremity; tibiæ with black bands at extremities. Fore wing yellow; the base orange with small black spots on costa and below cell; an oblique black subbasal line, slightly incurved below costa; antemedial line double, black filled in with orange, oblique; medial line double, black filled in with orange and with a black discoidal striga on it, oblique, rather constricted just below the cell and confluent above inner margin with the double black postmedial line filled in with orange, which is curved inwards to meet it and expands somewhat at costa; a straight black subterminal line; the terminal area orange with a black terminal line; cilia fuscous with a fine yellow line at base. Hind wing yellow; an oblique elliptical orange discoidal spot defined by black; postmedial line black, incurved below submedian fold and bent outwards below costa to join the black subterminal line, which is diffused at apex and ends on termen at vein 1; the tornal area orange with two black points on it; a black terminal line; cilia yellowish white with a black line at middle.

♀. Abdomen with diffused black bands on terminal segments; fore wing with the black lines much stronger, the postmedial and subterminal lines confluent except towards costa; hind wing with the black markings much stronger, the inner area suffused with black, the terminal area black, the postmedial line defined by yellow in part only, the subterminal line by slight yellow striæ.

Hab. N.E. Rhodesia, E. Luangwa distr., Petauke (*Neave*), 1 ♂, 1 ♀ type. *Exp.* 24 mm.

Glyphodes sinuata Fabr. Spec. Ins. ii. p. 267 (1781).

N.W. Rhodesia, Alala plateau; N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley, Chambezi valley.

Euclasta defamatalis Wlk. xviii. 544 (1859).

N.E. Rhodesia, Luangwa valley.

POLYTHLIPTA CAMPTOZONA, sp. n. (Pl. XLI. fig. 2.)

♀. Head, thorax, and abdomen white tinged with rufous; fore tibiæ with brown bands; mid tibiæ with brown streaks. Fore wing pale fulvous yellow; an elliptical hyaline white subbasal spot below the cell conjoined to a wedge-shaped mark in cell and touching a triangular spot on inner margin, all defined by fuscous; a rounded spot in middle of cell and quadrate patch on discocellulars conjoined to a small spot beyond lower angle of cell and both defined by fuscous except above; a quadrate patch defined by fuscous below end of cell, its outer edge somewhat indented; a hyaline white band defined by fuscous from below costa towards apex to above vein 3, its upper extremity bent outwards and rounded and its lower bent outwards and triangular; a rounded patch above tornus; a slight fuscous terminal line. Hind wing semihyaline white; an oblique fuscous discoidal bar; postmedial band ochreous defined on each side by fuscous, obliquely angled outwards at middle to the terminal band, which is ochreous defined on inner side by fuscous, expanding into a patch at apex and its inner edge sinuous towards tornus; a fine fuscous terminal line.

Hab. N.W. RHODESIA, Kapopo (*Neave*), 2 ♀ type. *Exp.* 32 mm.

LEPYRODES GEOMETRALIS Guen. Delt. & Pyr. p. 278, pl. 8. f. 6 (1854).

N.E. RHODESIA, E. Luangwa distr., Luangwa valley, Chambezi valley.

LEPYRODES ARGYROSTICTA, sp. n. (Pl. XLI. fig. 3.)

♂. Head, thorax, and abdomen purplish red mixed with brownish ochreous, the vertex of head whitish, the abdomen with pale segmental lines towards extremity; palpi white at base; pectus, legs, and ventral surface of abdomen whitish. Fore wing purplish red with traces of an ochreous brown ground-colour; antemedial line indistinct, oblique, sinuous, with traces of a small pale spot beyond it in cell; a round silvery white spot defined by black in end of cell and a similar larger spot below the cell with slight dark line from it to inner margin; an irregular silvery white mark defined by black beyond the cell, its inner edge indented and its outer edge angled outwards beyond lower angle of cell, a dark line from it to costa; cilia fuscous with black line at base and white tips. Hind wing purplish red with traces of a brownish ochreous ground-colour; a small white spot defined by blackish in lower part of cell; a quadrate silvery white spot defined by black beyond the cell, connected with a small bifid spot below it, followed by a point nearer base, then a lunulate spot connected by an oblique blackish line with inner margin, the uppermost spot with two lines to costa; cilia black at base, pure white at tips; the underside paler with the basal and inner areas whitish.

♀. Darker; fore wing with the spot in end of cell minute; hind wing with the spots reduced and more separated.

Hab. Congo, Katanga, Kambove (*Neave*), 1 ♂; N.E. Rhodesia, N. Luangwa, Mt. Ulungu (*Neave*), 1 ♀, E. Luangwa distr. (*Neave*), 1 ♂, Chambezi valley (*Neave*), 3 ♂, Fort Jameson (*Neave*), 1 ♂ type, L. Bangweolo (*Neave*), 1 ♂, Mpika. *Exp.* 24–26 mm.

Crocidolomia binotalis Zell. Lep. Micr. Caffr. p. 65 (1852).

N.E. Rhodesia, N. Luangwa, Mt. Ulungu, upper Luangwa valley, Chambezi valley.

Sameodes cancellalis Zell. Lep. Micr. Caffr. p. 34 (1852).

N.E. Rhodesia, E. Luangwa distr., upper Luangwa valley.

Sameodes olesialis Wlk. xviii. 748 (1859).

N.E. Rhodesia, E. Luangwa distr., Luangwa valley.

Terastia margaritis Feld. Reis. Nov. pl. 136. f. 40 (1875).

N.E. Rhodesia, E. Luangwa distr.

Ischnurges lancinalis Guen. Delt. & Pyr. p. 169 (1854).

N.E. Rhodesia, Chambezi valley.

Crocidophora flaviciliata, sp. n. (Pl. XLI. fig. 4.)

♂. Head and thorax brownish ochreous tinged with purplish red; antennæ with the shaft whitish; abdomen brownish white, the extremity suffused with fuscous and the anal tuft tinged with rufous; palpi white at base; pectus, legs, and ventral surface of abdomen pale ochreous. Fore wing grey-brown with a faint purplish tinge, the costa tinged with ochreous, the termen narrowly and cilia ochreous yellow. Hind wing pale grey-brown, the termen very narrowly from apex to submedian fold and the cilia yellowish white.

Hab. Congo, S.E. Katanga (*Neave*), 1 ♂ type. *Exp.* 32 mm.

Crocidophora caffralis, sp. n. (Pl. XLI. fig. 5.)

Head, thorax, and abdomen fulvous yellow; palpi at base, vertex of head, pectus, the greater part of legs, and ventral surface of abdomen white. Fore wing fulvous yellow, the area between subcostal nervure and submedian fold thinly scaled; an indistinct postmedial line, obliquely curved from costa to vein 4, then incurved; the terminal area with a slight fuscous shade. Hind wing yellow with faint traces of a postmedial line.

Hab. N.E. Rhodesia, E. Luangwa distr. (*Neave*), 4 ♀, Luangwa valley (*Neave*), 1 ♂, 1 ♀, Mpeta (*Coryndon*), 1 ♀; MASHONALAND (*Dobbie*), 1 ♂, 1 ♀; CAPE COLONY, Transkei (*Miss F. Barrett*), 1 ♂ type. *Exp.* 28 mm.

MARUCA TESTULALIS Geyer, Hübn. Samml. Exot. Schmett. iv. 4, p. 12, ff. 629, 630 (1827).

N.E. RHODESIA, Serenji distr., Chambezi valley.

POLYGRAMMODES PHYLLOPHILA Butl. A. M. N. H. (5) ii. p. 296 (1878).

N.E. RHODESIA, Chinsali distr.

PACHYZANCLA PHÆOPTERALIS Guen. Delt. & Pyr. p. 349 (1854).

N.E. RHODESIA, upper Luangwa valley.

PACHYZANCLA BIPUNCTALIS Fabr. Ent. Syst. iii. 2, p. 227 (1794).

N.E. RHODESIA, upper Luangwa valley.

PHLYCTÆNODES ARGYROSTACTA, sp. n. (Pl. XLI. fig. 6.)

♂. Head and thorax pale yellow, the palpi, shoulders, and antennæ rufous; fore legs in front and mid and hind femora fuscous; abdomen fulvous yellow. Fore wing pale yellow, the costal area blood-red, the costal edge black; an antemedial blood-red band, acutely angled outwards in submedian fold, some silvery scales on it; triangular blood-red patches with leaden-silvery centres projecting from the costal area at middle and end of cell; a blood-red subterminal band with leaden-silvery band on its inner edge from below costa to inner margin towards which it narrows, its inner edge emitting red streaks on veins 7, 6 and a projection to lower angle of cell, its outer edge curved; a fine blackish terminal line defined on inner side by red; cilia tinged with red at base and with fuscous lines near base and tips. Hind wing pale orange-yellow; the underside with the costal area tinged with brown, a rather diffused brownish subterminal line.

Hab. N.W. RHODESIA, Alala plateau (*Neave*), 1 ♂; N.E. RHODESIA, Chambezi valley (*Neave*), 1 ♂ type. *Exp.* 26 mm.

PHLYCTÆNODES FLAVINIGRALIS, sp. n. (Pl. XLI. fig. 7.)

♂. Head and thorax black with a silvery gloss, the vertex of head and neck orange, the metathorax with lateral orange streaks; palpi orange except at tips; pectus and legs orange, the latter streaked with black; abdomen orange with dorsal and ventral series of black spots. Fore wing black with a leaden gloss; diffused yellow fasciæ below base of cell and above inner margin and a rather elongate subbasal spot in cell; a medial spot in cell and rather elongate spots below the cell and above inner margin; a rounded patch beyond the cell with minute streak below it and quadrate spot in submedian interspace; a small subapical spot; subterminal points at vein 6 and in submedian fold and a spot at middle. Hind wing golden orange; the costal edge black; a terminal black band narrowing to tornus; the underside with small black discoidal spot and postmedial tooth from costa.

Hab. N.W. RHODESIA, Alala plateau (*Neave*), 2 ♂; N.E. RHODESIA, Serenji distr. (*Neave*), 1 ♂ type. *Exp.* 24 mm.

DIASEMIA DISJECTALIS Zell. Lep. Micr. Caffr. p. 16 (1852).

N.E. RHODESIA, Chinsali distr.

ANTAGASTRA CATALAUNALIS Dup. Lép. Fr. viii. p. 330, pl. 232. f. 8 (1830).

N.E. RHODESIA, E. Luangwa distr., Chambezi valley.

NOORDA RUBRICOSTALIS, sp. n. (Pl. XLI. fig. 8.)

Head and thorax rufous; tegulæ and patagia with pale yellow fasciæ; palpi at base, pectus, and legs white, the fore tibiæ with fuscous band at extremity; abdomen ochreous white. Fore wing ochreous white, the costal area suffused with rufous, the terminal area purplish rufous defined on inner side by a very minutely waved, slightly incurved black line; cilia ochreous white tinged with rufous. Hind wing semihyaline white, the terminal area pale fuscous, narrowing to a point at vein 1; cilia white with a pale fuscous line near base.

Hab. N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♂ type; MASHONALAND (*Dobbie*), 1 ♀. *Exp.* 22 mm.

MECYNA GILVATA Fabr. Syst. Ent. p. 290 (1791).

Hab. CONGO, S.E. Katanga; N.E. RHODESIA, N. Luangwa, Mt. Ulungu, E. Luangwa distr., Luangwa valley, Serenji distr., Chambezi valley, Chinsali distr.

CRIOPTHONA SABULOSALIS, sp. n. (Pl. XLI. fig. 24.)

Head and thorax ochreous white tinged with brown; abdomen ochreous white. Fore wing ochreous thickly irrorated with dark brown, the costal edge white; an indistinct, rather diffused, waved dark antemedial line; a whitish discoidal lunule defined on inner side by fuscous; postmedial line fine, dark, excurved below costa, incurved at discal fold, then waved, bent inwards below vein 3 to below angle of cell; a fuscous terminal line; cilia whitish. Hind wing white, the termen slightly tinged with ochreous; cilia white with a slight dark line near base; the underside with the costal and terminal areas irrorated with red-brown, a dark postmedial line excurved at median nervule, a terminal series of dark striæ.

Hab. BR. E. AFRICA, Kibauni (*Crawshay*), 1 ♂ type, Eb Urru (*Betton*), 1 ♂; N.E. RHODESIA, E. Luangwa distr. (*Neave*), 1 ♀, Chambezi valley (*Neave*), 1 ♀. *Exp.* 22 mm.

PIONEA ABLACTALIS Wlk. xviii. 660 (1859).

N.W. RHODESIA, Alala plateau; N.E. RHODESIA, E. Luangwa distr.

Pyrausta impunctata Warr. Nov. Zool. iv. p. 129 (1897).
N.E. Rhodesia, Chambezi valley, Bangweolo distr.

Pyrausta rufilinealis, sp. n. (Pl. XLI. fig. 23.)

♀. Head, thorax, and abdomen yellow; palpi rufous, white at base; shoulders rufous; pectus, legs, and ventral surface of abdomen white, the fore tibiæ rufous on inner side. Fore wing yellow, the base of costal area tinged with rufous; an oblique rufous antemedial line; traces of a rufous point in middle of cell; an oblique rufous discoidal bar; postmedial line rufous, incurved from costa to vein 4, bent inwards at vein 2 to below end of cell and slightly excurved above inner margin; a terminal series of rufous points except towards apex; cilia tinged with rufous at tips. Hind wing yellow; a rufous discoidal point; postmedial line rufous, bent outwards between veins 4 and 2, then retracted and oblique to above tornus; a terminal rufous line from apex to vein 2.

Hab. N.E. Rhodesia, E. Luangwa distr., Petauke (*Neave*), 1 ♀ type. *Exp.* 32 mm.

Pyrausta eos Druce, A. M. N. H. (7) ix. p. 329 (1902).
N.E. Rhodesia, Chambezi valley, Bangweolo distr.

Pyrausta incoloralis Guen. Delt. & Pyr. p. 333 (1854).
N.E. Rhodesia, E. Luangwa distr., Luangwa valley.

ÆGERIADÆ.

Ichneumenoptera cyanescens, sp. n. (Pl. XLI. fig. 10.)

Head and thorax cupreous black-brown; frons white at sides; neck with yellow ring; patagia with yellow streak above and two points on outer edge; pectus fuscous and white, the tibiæ and tarsi ringed with white; abdomen black shot with blue, with slight white segmental rings and the anal tuft with slight white streaks at sides. Wings hyaline, the veins and margins black-brown; fore wing with the costal area and discoidal lunule black shot with blue.

Hab. Congo, Katanga, Kambove (*Neave*), 1 ♂ type; N.E. Rhodesia, E. Luangwa distr. (*Neave*), 1 ♀, Bangweolo distr. (*Neave*), 1 ♂. *Exp.* 22 mm.

Lepidopoda flavipalpis, sp. n. (Pl. XLI. fig. 17.)

♂. Head, thorax, and abdomen black-brown; palpi and frons yellow, the former with some black and fuscous scales on 2nd joint; vertex of head with yellow streaks behind antennæ; neck with yellow ring; patagia with yellow streaks near upper edge; fore coxæ yellow; tibiæ banded with yellow, the spurs and tarsi below white; abdomen with yellow spot at base of anal tuft, lateral orange bands and the anal tuft orange below. Fore wing hyaline, the veins and margins black-brown with a silvery gloss; a black-brown discoidal bar connecting the dark costal and inner areas; the rounded hyaline postmedial patch edged with orange. Hind wing hyaline, the veins and margins narrowly black-brown; a slight black tooth at upper angle of cell; cilia with a cupreous tinge.

Hab. N.E. RHODESIA, upper Luangwa valley (*Neave*), 1 ♂ type. *Exp.* 22 mm.

LEPIDOPODA FULVIPES, sp. n. (Pl. XLI. fig. 11.)

♀. Head and thorax dark brown with a leaden gloss; palpi yellow with a dark ring at extremity of 2nd joint; neck with yellow ring; fore coxæ yellow; mid tibiæ except at base, the hind tibiæ and the tarsi except at extremities orange; abdomen brown with a leaden gloss and some yellow scales, lateral orange streaks emitting teeth on to ventral surface, the anal tuft orange at extremity. Fore wing black-brown with a cupreous gloss, the cell and a streak below it hyaline; three short hyaline streaks beyond the discoidal bar. Hind wing hyaline, the veins and margins narrowly cupreous brown, the inner margin orange towards base.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀ type. *Exp.* 22 mm.

LEPIDOPODA OBLIQUIZONA, sp. n. (Pl. XLI. fig. 18.)

Antennæ of male bipectinate above, serrate and fasciculate below.

♂. Head, thorax, and abdomen black glossed with blue and with some yellow mixed; palpi yellow; gulæ and throat white; legs black-brown and yellow; abdomen with lateral white bars. Fore wing dark cupreous brown with some yellow scales; a triangular hyaline patch in middle of cell, its upper extremity produced; an oblique hyaline band crossed by dark streaks on the veins from below costa towards apex to vein 3 just beyond the cell. Hind wing hyaline, the base, veins, and margins cupreous brown with some yellow scales, the hyaline extending to inner margin at middle; a blackish discoidal bar.

Hab. N.E. RHODESIA, L. Bangweolo distr. (*Neave*), 1 ♂ type. *Exp.* 24 mm.

MELITTIA AURIPLUMIA, sp. n. (Pl. XLI. fig. 12.)

♀. Head, thorax, and abdomen black-brown with some white and yellow scales; frons with white lines at sides; tibiæ banded with white, the fore tarsi white above, the mid tarsi ringed with white, the hind tibiæ and tarsi fringed with orange hair on outer side; abdomen ventrally banded with white. Fore wing dark cupreous brown, the terminal area irrorated with white; a wedge-shaped hyaline patch in cell bifid at extremity, a streak below the cell and five streaks beyond it shortening towards costa. Fore wing hyaline, the veins and margins narrowly black, the hair on inner margin and the cilia grey-brown.

Hab. CONGO, Katanga, Kambove (*Neave*), 1 ♀ type. *Exp.* 34 mm.

MELITTIA IGNIDISCATA, sp. n. (Pl. XLI. fig. 19.)

Head blackish mixed with white; palpi white, black in front; sides of frons and gulæ white; thorax fulvous, with some black and white on tegulæ and shoulders; pectus and legs bluish white mixed with black, the long hair on hind legs black with patches of white and some yellow at middle of tibiæ and tarsi; abdomen black with patches of golden-white scales and grey-white segmental lines, some fulvous at base, the ventral surface bluish white. Fore wing hyaline yellowish towards base, the veins and margins blackish with white scales mixed; a streak of fiery-red scales above vein 1; discoidal bar black with fiery-red patch on its inner edge; the outer edge of postmedial hyaline patch fiery red. Hind wing hyaline, yellowish towards base, the veins and margins narrowly black-brown; the hair on inner margin and the cilia grey-brown with a yellowish tinge.

Ab. 1. Thorax with dark brown scales mixed; wings not yellowish towards base.

Hab. BR. C. AFRICA, Blantyre (*Byrn*), 3 ♂, 1 ♀; N.E. RHODESIA, Serenji distr. (*Neave*), 1 ♂ type; S. RHODESIA, Bulawayo (*Marshall*), 1 ♂, 1 ♀. *Exp.* 34 mm.

HEPIALIDÆ.

GORGOPIS LIBANIA Stoll, Pap. Exot. iv. p. 128, pl. 356. f. 6 (1782).

PORTUGUESE E. AFRICA, S. Angoniland.

DALACA STICTIGRAPHA, sp. n. (Pl. XLI. fig. 13.)

♂. Head and thorax fuscous brown with a greyish tinge; antennæ fulvous; abdomen greyish ochreous mixed with brown. Fore wing fuscous brown irrorated with white scales except on costal area; traces of a sinuous dark antemedial line; an indistinct obliquely curved waved dark line defined on outer side by white scales from upper angle of cell to inner margin at the antemedial line, the area beyond it more thickly irrorated with white; an obliquely curved series of small blackish spots defined by white scales from below apex to inner margin; a terminal series of blackish points defined by white scales. Hind wing grey-brown, the basal area ochreous.

♀. Head, thorax, and abdomen pale grey-brown; fore wing with the markings more obscure.

Hab. CONGO, S.E. Katanga (*Neave*), 1 ♀; N.E. RHODESIA, Serenji distr. (*Neave*), 4 ♂ type, Petauke distr. (*Neave*), 2 ♂. *Exp.* 38–44 mm.

Dalaca holophæa, sp. n. (Pl. XLI. fig. 20.)

♂. Head and thorax fuscous brown; abdomen grey-brown. Fore wing grey-brown; a subbasal grey annulus below costa and three annuli from beyond it to inner margin; antemedial line double, grey, obliquely curved to median nervure, where it is constricted, then erect; the terminal half of costa with grey striæ; a sinuous grey medial line met at vein 2 by a curved series of striæ from beyond upper angle of cell; postmedial line dark defined on inner side by grey, sinuous to vein 3, then incurved; a subterminal line formed of dark striæ defined by grey, bent outwards at vein 7; cilia dark brown, greyish ochreous at tips. Hind wing pale grey-brown.

Hab. Congo, S.E. Katanga (*Neave*), 3 ♂ type. *Exp.* 30 mm.

EXPLANATION OF THE PLATES.

Plate XXXVI.

Fig.
1. *Syntomis hemiphœnica.* ♂.
2. „ *miozona.* ♀.
3. „ *croceizona.* ♀.
4. *Eressa pleurosticta.* ♀.
5. *Pseudmelisa chalybea.* ♀.
6. *Ilema heterogyna.* ♂.
7. *Pseudlepista atrizona.* ♂.
8. „ *flavicosta.* ♀.
9. *Borolia rosescens.* ♀.
10. *Paraxestis irrorata.* ♂.
11. *Arcyophora fuscicona.* ♂.
12. *Massagidia tenuifascia.* ♀.
13. *Xanthospilopteryx atriventralis.* ♂.
14. „ *neavi.* ♀.
15. *Ægocera geometrica.* ♀.
16. *Erizada esmeralda.* ♂.
17. *Carea thermistis.* ♂.
18. *Rhodochlæna cuneifera.* ♂.

Fig.
19. *Cirphis corticea.* ♀.
20. *Metaculasta endoglauca.* ♂.
21. *Urbona lacteata.* ♂.
22. *Ophiusa xanthoptera.* ♂.
23. *Xanthospilopteryx discosticta.* ♂
24. *Hoplarista hæmaplaga.* ♂.
25. *Tuerta ovifera.* ♀.
26. *Westermannia albigrisea.* ♂.
27. „ *ædiplaga.* ♀.
28. *Timora albipuncta.* ♂.
29. „ *daphæna.* ♂.
30. *Anaphosia astrigata.* ♀.
31. „ *pectinata.* ♂.
32. „ *eurygrapha.* ♂.
33. *Acantharctia tenuifasciata.* ♂.
34. *Secusio atrizonata.* ♂.
35. *Chabuata rufilinea.* ♂.
36. *Cirphis dialeuca.* ♂.

Plate XXXVII.

Fig.
1. *Remigia heterochroa.* ♂.
2. „ *griseicilia.* ♂.
3. „ *molybdopasta.* ♀.
4. *Calesia arhoda.* ♂.
5. *Chalciope ditrigona.* ♂.
6. „ *albifissa.* ♀.
7. *Speiredonia prunicolora.* ♂.
8. *Plecoptera sarcistis.* ♂.
9. „ *punctilineata.* ♂.
10. *Mesogenea persinuosa.* ♂.
11. *Cosmophila bidentata.* ♂.
12. *Ctenusa rufirena.* ♀.
13. *Ophiusa gonoptera.* ♂.
14. „ *porphyrescens.* ♂.
15. „ *goniophora.* ♂.
16. *Remigia persinuosa.* ♂.
17. *Plecoptera infuscata.* ♂.
18. *Rhynrodes nigriciliata.* ♂.

Fig.
19. *Baniana trigonospila.* ♂.
20. *Cosmophila retracta.* ♂.
21. *Ophiusa albitermia.* ♂.
22. „ *tumiditermina.* ♂.
23. „ *mesonephele.* ♀.
24. *Chalciope microgonia.* ♀.
25. *Speiredonia plicata.* ♂.
26. *Plecoptera trichophora.* ♂.
27. *Baniana heterospila.* ♂.
28. „ *pyramidalis.* ♂.
29. „ *aspila.* ♂.
30. „ *culminifera.* ♂.
31. *Plecoptera megarthra.* ♂.
32. „ *melalepis.* ♂.
33. „ *flavilinea.* ♂.
34. „ *thermozona.* ♂.
35. „ *laniata.* ♂.

PLATE XXXVIII.

Fig.
1. *Plecoptera grisea.* ♂.
2. *Gnamptogyia diagonalis.* ♂.
3. *Antarchæa umbrifera.* ♂.
4. *Pleurona trogopera.* ♂.
5. *Leptarva fulvicolora.* ♂.
6. *Parathermes lophocera.* ♂.
7. „ *atripunctata.* ♂.
8. *Zethes cœnotype.* ♂.
9. *Simplicia pachycera.* ♂.
10. *Antarchæa hæmaceps.* ♂.
11. *Baziza phæophlebia.* ♂.
12. *Geodena conifera.* ♀.
13. *Antarchæa olivescens.* ♂.
14. *Lymantria flavicilia.* ♀.
15. *Olapa fulviceps.* ♂.
16. *Hyblæa flavifasciata.* ♂.
17. *Attatha ethiopica.* ♂.
18. *Hibrildes neavi.* ♀.

Fig.
19. *Hyblæa flavipicta.* ♂.
20. *Antarchæa lentistriata.* ♂.
21. *Euproctis nepheloptera.* ♂.
22. *Deilemera chalcosidia.* ♀.
23. *Antarchæa hæmatoessa.* ♀.
24. *Heteronygmia strigitorna.* ♂.
25. „ *leucogyna.* ♂.
26. *Hyblæa xanthia.* ♂.
27. *Dichromia leucozona.* ♀.
28. *Hypena verticalis.* ♂.
29. „ *tetrasticta.* ♀.
30. *Aroa achrodisca.* ♂.
31. *Euproctis fulvipennis.* ♂.
32. *Naarda xanthonephra.* ♀.
33. *Rhynchina crassisquamata.* ♀.
34. „ *leucodonta.* ♂.
35. *Deinhypena apicata.* ♀.

PLATE XXXIX.

Fig.
1. *Stegania glaucichroa.* ♂.
2. „ *eurycraspis.* ♀.
3. *Tephrina arcifera.* ♂.
4. *Zamarada flavicincta.* ♂.
5. „ *pyrocincta.* ♂.
6. „ *denticincta.* ♂.
7. *Boarmia pallidizona.* ♂.
8. *Mesocœla flavimacula.* ♂.
9. „ *rufescens.* ♂.
10. *Susica pyrocausta.* ♂.
11. *Miresa ustitermina.* ♂.
12. *Phægorista xanthosoma.* ♀.
13. *Stegania diagramma.* ♂.
14. *Spatalia argyrophora.* ♂.
15. *Leucophlebia xanthopis.* ♂.
16. *Macroplectra rufopallens.* ♂.
17. *Altha lacides.* ♂.
18. *Pseudometa cymographa.* ♂.
19. *Hoplojana anæmica.* ♂.

Fig.
20. *Azygophleps atrifasciata.* ♀.
21. *Miresa semicalida.* ♂.
22. *Zinara discophora.* ♂.
23. *Phiala rubrivena.* ♂.
24. *Induna nubicincta.* ♂.
25. *Ichthyura ferruginea.* ♂.
26. *Polyptychus neavi.* ♀.
27. *Semioptila flavidiscata.* ♂.
28. *Altha chionostola.* ♀.
29. *Prasinocyma rhodocera.* ♀.
30. *Comibæna rhodosticta.* ♂.
31. *Neurotoca endorhoda.* ♂.
32. *Acollesis trilineata.* ♂.
33. *Craspedia glaucocyma.* ♂.
34. „ *diffusizona.* ♂.
35. „ *argyroleuca.* ♂.
36. *Terina crocea.* ♂.
37. *Boarmia acygonia.* ♂.

PLATE XL.

Fig.
1. *Crambus fuscivittalis.* ♀.
2. „ *sectitermina.* ♀.
3. *Platytes argyrodonta.* ♂.
4. *Chilo fuscicilia.* ♀.
5. *Charltona chrysopasta.* ♀.
6. „ *plurivittalis.* ♀.
7. *Ancylolomia pectinifera.* ♂.
8. „ *endophæalis.* ♀.
9. *Polyocha sanguifusalis.* ♂.
10. *Staphylinochrous fulva.* ♂.
11. *Thermochrous fumicincta.* ♂.
12. *Malamblia flavipalpis.* ♀.
13. *Pompostola hemichrysa.* ♀.
14. *Chrysopoloma albidiscalis.* ♀.
15. *Gonometa griseocincta.* ♂.

Fig.
16. *Chrysopoloma inspersa.* ♀.
17. *Staphylinochrous euryperalis.* ♂.
18. *Thermochrous stenocraspis.* ♂.
19. *Arniocera chalcopasta.* ♂.
20. *Rhodoneura fuscibasis.* ♂.
21. *Pogononeura xantholepis.* ♂.
22. *Argyractis periopis.* ♂.
23. *Chalcidoptera rufilinealis.* ♂.
24. *Lygropia atrinervalis.* ♂.
25. *Neostege holoxutha.* ♂.
26. *Mussidia albipartalis.* ♀.
27. *Bostra fuscipennis.* ♀.
28. „ *perrubida.* ♂.
29. „ *thermialis.* ♂.

PLATE XLI.

Fig.
1. *Glyphodes xanthostola.* ♂.
2. *Polythlipta camptozona.* ♀.
3. *Lepyrodes argyrosticta.* ♂.
4. *Crocidophora flaviciliata.* ♂.
5. „ *caffralis.* ♂.
6. *Phlyctænodes argyrostacta.* ♂.
7. „ *flavinigralis.* ♂.
8. *Noorda rubricostalis.* ♂.
9. *Macna hampsoni.* ♀.
10. *Ichneumenoptera cyanescens.* ♂.
11. *Lepidopoda fulvipes.* ♀.
12. *Melittia auriplumia.* ♀.
13. *Dalaca stictigrapha.* ♂.
14. *Polyptychus baxteri.* ♀.
15. *Philotherma fuscescens.* ♂.

Fig.
16. *Gonometa drucei.* ♀.
17. *Lepidopoda flavipalpis.* ♂.
18. „ *obliquizona.* ♂.
19. *Melittia ignidiscata.* ♂.
20. *Dalaca holophæa.* ♂.
21. *Macalla melanobasis.* ♂.
22. *Glyphodes mayottalis.* ♂.
23. *Pyrausta rufilinealis.* ♀.
24. *Criopthona sabulosalis.* ♂.
25. *Rhodoneura discata.* ♂.
26. *Sylepta megastigmalis.* ♂.
27. *Constantia aglossalis.* ♀.
28. *Bostra tenebralis.* ♂.
29. *Altha tegula.* ♂.

2. The Urogenital Organs of *Chimæra monstrosa*. By T. H. BURLEND, M.A. (Camb.), B.Sc. (Lond.), late Scholar of Christ's College, Cambridge; Assistant Lecturer and Demonstrator in Zoology, University College, Cardiff.*

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(Text-figures 40–53.)

Introduction.

The study of the structure of the Chimæroids is full of interest on account of the diversity of opinion which exists with regard to the relationship of the Holocephali to the Elasmobranchii. Although retaining many primitive characters in the skeleton, brain, sense-organs, and viscera, the Holocephali have nevertheless acquired very specialised structures presumably associated with their occurrence and mode of life. Referring more particularly to the urogenital organs and their accessory parts, the Chimæroid is unique among Fishes in the possession in the male of a pair of "middle claspers,"—regarded by T. J. Parker (1886) as a rudimentary third pair of limbs,—and in the female of a so-called "receptaculum seminis," mentioned by Leydig (1851) and by subsequent writers.

Notwithstanding the excellent contributions of Leydig and Hyrtl over fifty years ago, and the more recent work of Mazza and Redeke, it was felt that a more detailed account, with figures, of the urogenital organs of *Chimæra* is not readily accessible to English readers, and it was to supply this want that the work was primarily undertaken. Further investigation showed that the published accounts were at variance on points of the first importance, and this fact can now be attributed to: (1) the use of imperfectly preserved material, and (2) the structural differences existing between animals which are immature and those which have attained sexual maturity. With the material at my disposal I have been able to make additions to the above accounts and also to verify much of the early work which some later writers have in part disputed.

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* Communicated by Professor W. N. PARKER, Ph.D., F.Z.S.

My best thanks are due to Professor W. N. Parker of this College, who suggested the work and rendered me much assistance by his friendly criticism and advice in the course of these investigations. A preliminary account of the relations of the vasa efferentia has already appeared under our joint names (**15**).

Historical.

Leydig (1851) described the urogenital system of *Chimæra monstrosa*, both male and female. He observed the network of small ducts on the ventral surface of the testis and the manner in which these minute ducts unite to form the larger ducts—vasa efferentia—which are directed towards the "Nebenhoden" or coiled anterior portion of the sperm-duct. The different regions of the sperm-duct are described, though not by the aid of transverse sections, but by dissection only. Moreover, Leydig's work is very important in that he differentiates in the male the posterior brown kidney from the anterior white structure called by Hyrtl the "Leydig's gland," and he examined the secretion from this latter. The author concluded that it must be regarded as an accessory genital gland. In his account of the female organs Leydig made special reference to the "shell gland" and "uterus" of the oviduct, and looked upon the "digitiform gland"—the "receptaculum seminis" of later writers—as most probably an accessory female genital gland.

Hyrtl (1853) continued Leydig's work on *Chimæra*, although he was not so fortunate in obtaining fresh material. He could not decide whether the cavity dorsal to the peritoneum between testis and "Nebenhoden" was a lymph sinus, or whether it was in connection with the anterior coiled end of the sperm-duct and consequently a cœlomic intermediary between the testis and its duct. Both Leydig and Hyrtl believed that vasa efferentia must be present, but could not locate them with accuracy, nor determine their relation with the sperm-duct. Hyrtl regarded the most anterior duct from the Leydig's gland as the real beginning of the sperm-duct: the "digitiform gland" was held to be a reservoir for the reception of the sperms of the male.

Mazza (1894) believes that the testis is not connected with its "Nebenhoden," the spermatozoa from the former reaching it by first passing into a portion of the body cavity and thence getting into the coiled anterior end of the sperm-duct by means of canals (? mesonephric tubules).

Redeke (1898) does not throw any light on this point. He divides the kidney into cranial, median, and caudal zones; but this distinction is untenable, since the cranial zone as indicated in his figures is in reality the anterior coiled end of the sperm-duct, the median zone is Leydig's gland, and the caudal zone alone is excretory in the adult male. The author emphasizes the primitive nature of the kidney on account of its marked metamerism, and apparently believes that the sexual portion of the Selachian kidney is absent.

Bashford Dean (1906) does not recognise any "Geschlechtsniere."

W. N. Parker and T. H. Burlend (1909) show the relation between vasa efferentia and sperm-duct, the former uniting to give a longitudinal duct which is directly continuous with the coiled sperm-duct, so that the sexual part of the kidney or "Geschlechtsniere" is represented in the adult male by the "rete testis." Attention is also directed to the unsatisfactory use of the term "epididymis."

Material and Observations.

I am indebted to Mr. J. J. Neale of Cardiff for much valuable material. The Chimæras, both young and adult, male and female, had been carefully packed in ice and arrived at the laboratory in excellent condition. The alimentary canal having been removed, the whole urogenital region was fixed in corrosive sublimate, 90 per cent. alcohol or 5 per cent. formalin; but the first of these reagents proved the most satisfactory for histological work, the formalin-preserved specimens being most suitable for dissection. Many of the regions were sectioned, and this was especially difficult in the coiled sperm-duct region owing to the slow rate of penetration by the successive reagents. Weigert's Hæmatoxylin was used for staining in bulk, and Delafield's or Ehrlich's acid Hæmatoxylin for staining on the slide; the Cambridge rocking microtome was used in sectioning.

ADULT MALE *CHIMÆRA MONSTROSA.*

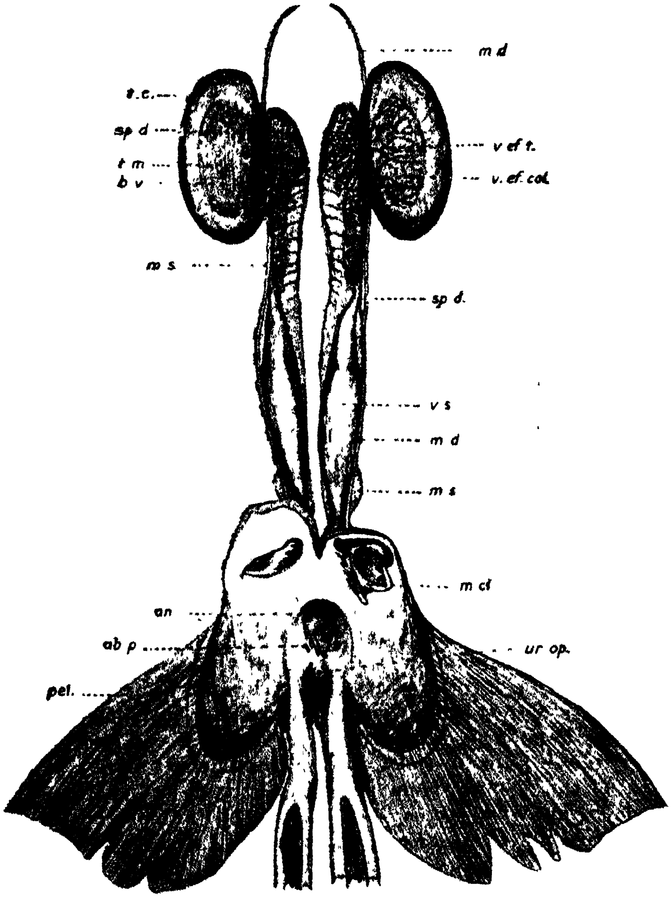
Genital organs.

(a) *Claspers.*—The anterior clasper, three-quarters of an inch in length, is situated on the head in the dorsal middle line a short distance behind the snout. It is a spherical knob-like organ bearing recurved spines ventrally, borne on a short thick stalk directed forwards; the whole organ is capable of being depressed into a shallow pit immediately in front of it and so of becoming less conspicuous.

The middle claspers are wing-like structures practically hidden away in pouches situated at the anterior limit of the pelvic-fin skeleton. In the extended condition they are seen to have cartilaginous supports bearing a row of from 5–7 forwardly projecting spines on the edge nearest the ventral middle line. In text-fig. 40 the left middle clasper is shown everted, *m.cl.*, the clasper on the right side being indicated in the normal position.

The posterior paired claspers, situated behind the anus and on each side of the urogenital aperture, are stout rod-like structures, each divided distally into two main portions with corresponding cartilaginous supports; the parts covered with skin are provided with numerous small forwardly projecting spines, and each clasper is about four inches in length; at the proximal end of

Text-fig. 40.



Uregenital organs of adult male *Chimæra monstrosa* (×½), with pelvic fins and claspers (ventral view).

ab.p., abdominal pore on right side; ***an.***, anus; ***b.v.***, blood-vessel (removed on right side); ***m.cl.***, left middle clasper extended; ***m.d.***, Müllerian duct; ***m.s.***, Leydig's gland; ***pel.***, pelvic fin: ***sp.d.***, sperm-duct or Leydig's duct; ***t.c.***, white cortical region of testis; ***t.m.***, green medullary region of testis; ***ur.op.***, urogenital opening; ***v.ef.col.***, longitudinal collector of efferent ducts; ***v.ef.t.***, network of efferent ducts on testis; ***v.s.***, seminal vesicle.

each is a swollen glandular structure which secretes a tallowy fluid of uncertain function.

(b) *Testes, vasa efferentia, sperm-ducts, and glands of Leydig.*—The bean-shaped testes attain a length of from 1½ to 2 inches in the well-developed male adult, and are suspended from the dorsal body-wall by peritoneum in the anterior region of the abdominal cavity. The peritoneum also covers the ventral surface of the corresponding Leydig's gland and sperm-duct, but not their dorsal surfaces, whereas it closely invests each testis and then passes over the neighbouring body-wall. In the centre of the dorsal surface of the testis there is a crescent-shaped flap of lymphoid tissue, between which and the inner border of the testis the peritoneum is not contiguous, and so a space is left between the latter and the testis (text-fig. 41, *t.f.*).

The ventral surface of the gonad in the fresh condition presents a white cortical and a greenish medullary area; beneath the peritoneum of the latter a network of minute vessels may be detected by the aid of a lens (text-fig. 40, *v.ef.t.*). These are continuous with the testis crypts and are filled with spermatozoa. They unite to form larger vessels, the whole network - rete testis —ultimately giving rise to six vasa efferentia, which are directed towards the anteriorly coiled sperm-duct on the inner side of the testis. After traversing, on the dorsal side of the peritoneum, the space between the gonad and its duct, they pass into a longitudinal collecting duct, the most posterior of the vasa efferentia, however, being an exception, since it never reaches the abovementioned duct but ends blindly in the peritoneum.

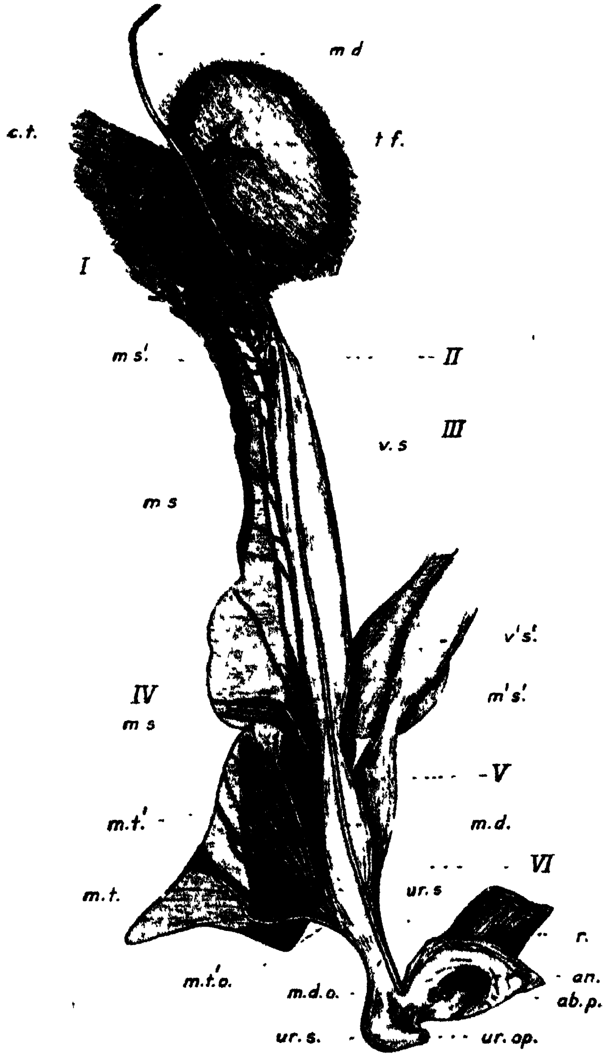
The collector passes forwards and gradually sinks in between the numerous coils of the sperm-duct of this region, but then bifurcates, and the two ducts formed proceed some short distance before finally fusing to establish the Leydig's duct or sperm-duct by an increase in diameter, but in the nature of the lining epithelium and contents identical with the collecting duct.

The sperm-duct does not pass directly backwards but forms a conspicuous much coiled structure which more posteriorly becomes less intricate, so that its winding course may be followed. After this, the diameter of the duct greatly increases and gives rise to a long straight sperm-vesicle, which becomes constricted about one-third of the distance from its posterior end, but enlarges again and ultimately opens near the opening of its fellow on the other side into a much narrower median urogenital sinus (text-fig. 41, *ur.s.*).

Running along the inner border of each sperm-duct, and later becoming dorsal to the sperm-vesicles, are two white glands showing distinct traces of metamerism, complete anteriorly but not so marked at their posterior ends: these are the glands of Leydig, almost ribbon-like in front, but less flattened dorso-ventrally, and much wider behind. They extend from the level of the middle of the testes to the constricted regions of the sperm-vesicles.

From each segment of Leydig's gland in front, there passes off

Text-fig. 41.



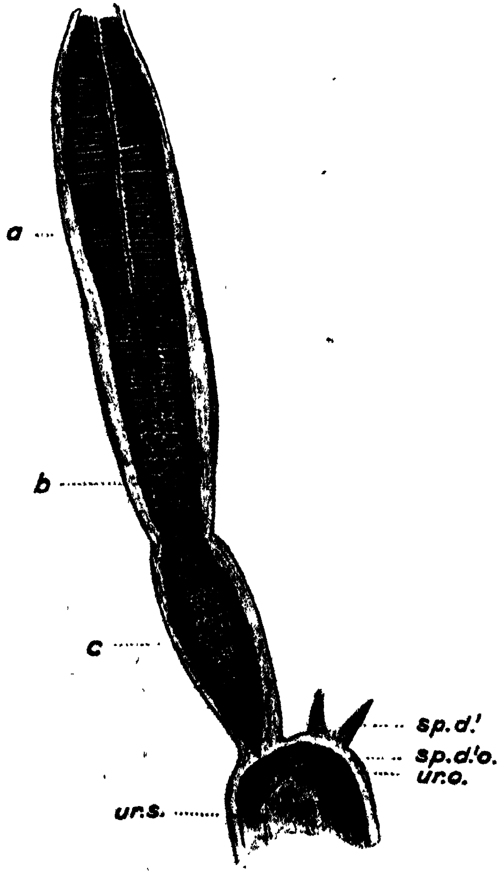
rogenital organs of adult male *Chimæra monstrosa*.
Dissection from right side.
in which sections shown in text-figs. 43 48 are taken respectively.
ominal pore; *an.*, anus; *c.t.*, peritoneum; *m.d.*, Müllerian duct;
ending of *m.d.*; *m.s.*, Leydig's gland, right side; *m.s.'*, collecting
ydig's gland opening into Leydig's duct; *m.'s.'*, Leydig's gland on
m.t., kidney; *m.t.'*, ureters; *m.t.'o.*, their opening into urogenital
t.f., flap of lymphoid tissue in centre of dorsal surface of testis; *ur.op.*,
enital aperture; *ur.s.*, urogenital sinus; *r.*, rectum; *r.s.*, right seminal
vesicle; *r.'s.'*, left seminal vesicle.

a duct which opens into the sperm-duct or sperm-vesicle, seven into the former and fifteen into the latter, the posterior ducts delaying their entrance into the sperm-vesicle and so having an oblique course between it and Leydig's gland.

Structure of Sperm-Vesicles.

These organs are white and thin-walled in fresh specimens, but the region for about an inch anterior to the constriction is pale

Text-fig. 42.



Right vesicula seminalis of adult male *Chimæra* opened from the ventral side.

a. White thin-walled region with horizontal partitions.
b. Pale green region traversed by a honeycomb network of partitions.
c. Posterior white thick-walled region.
sp.d.,' lower end of left vesicula seminalis; *sp.d'.o.*, opening of *sp.d.'* into *ur.s.*; *ur.o.*, opening into *ur.s.* of the ureters from the left side; *ur.s.*, urogenital sinus cut open.

greenish, due to its structure and contents. On dissection, the cavity is seen to be partly divided up along the whole length of the vesicula seminalis by thin connective tissue partitions, which are regularly arranged and resemble the septa of an Earthworm, in the anterior region. In the dorsal middle line, however, there is a channel along which the products of the sperm-duct may pass (text-fig. 42, *a*).

In the green region the partitions gradually lose their orderly arrangement; they appear further apart and then present a regular honeycomb on the inner face of the wall of the sperm-vesicle. Whereas, too, the contents of the anterior white region consist of closely packed spermatozoa along with some secretion from Leydig's gland, the contents in the green region consist to a large extent of the above secretion with spermatozoa scattered in it (text-fig. 42, *b*).

The posterior one-third of the seminal vesicle, beyond the constriction, is thick-walled, and the partitions become again repeated regularly, with a series of new partitions running at right angles and in the direction of the length—the contents of the compartments thus formed comprising free spermatozoa mixed with the secretion of Leydig's gland. The sperm-duct, not noticeable in the green region, now appears as a number of fine inter-communicating ducts, into which the last six ducts from the gland of Leydig empty (text-fig. 42, *c*).

Histology of Sperm-Ducts and Glands of Leydig.

Sections through the above glands show them to be of uniform structure throughout, viz., long coiled tubules of greater diameter than the urinary tubules, the lining epithelium being columnar and non-urinary, with much secretion containing nucleated material in the lumen. These tubules are continuous with the wider collecting tubes which pass across from the gland to the sperm-duct or seminal vesicle, and which also contain the same secretion as the tubules of Leydig's gland.

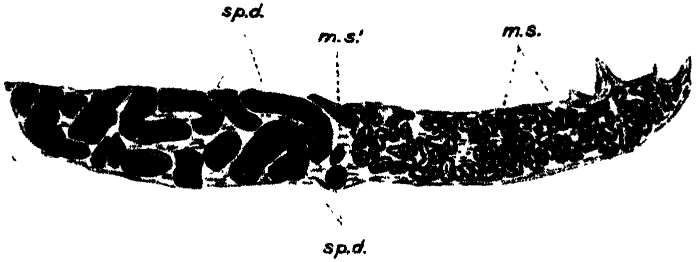
No glomeruli are found in the gland. This fact I was able to confirm by mounting thin pieces of the gland stained with hæmatoxylin and cleared in oil of cloves. This, no doubt, partly accounts for the white appearance of the glands of Leydig as compared with the brown kidney behind.

The nature of the contents of the sperm-ducts and sperm-vesicles was ascertained by transverse sections taken through these structures in the regions marked I–VI in text-fig. 41, and illustrated by text-figs. 43–48.

Text-fig. 43 is a somewhat diagrammatic representation of a section through region I of text-fig. 41. The sperm-duct is much coiled and its cavity is filled with spermatozoa, mostly free, although there is a tendency towards aggregation in some of the coils.

In region II Leydig's gland is larger and the sperm-duct no longer coiled. The latter contains free spermatozoa which fill the entire lumen and yet are not massed together into bundles (spermatophores) (text-fig. 44).

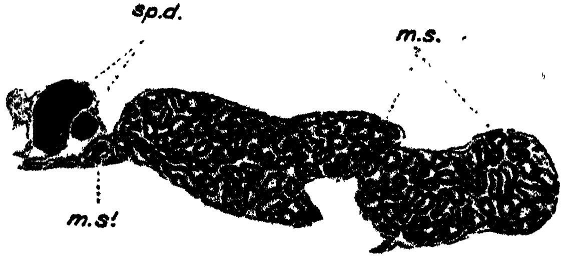
Text-fig. 43.



Transverse section of Leydig's gland and duct in region I of text-fig. 41.

m.s., coils of Leydig's gland cut across; *m.s.'*, duct connecting Leydig's gland with sperm-duct; *sp.d.*, coils of sperm-duct, filled with spermatozoa, cut across.

Text-fig. 44.

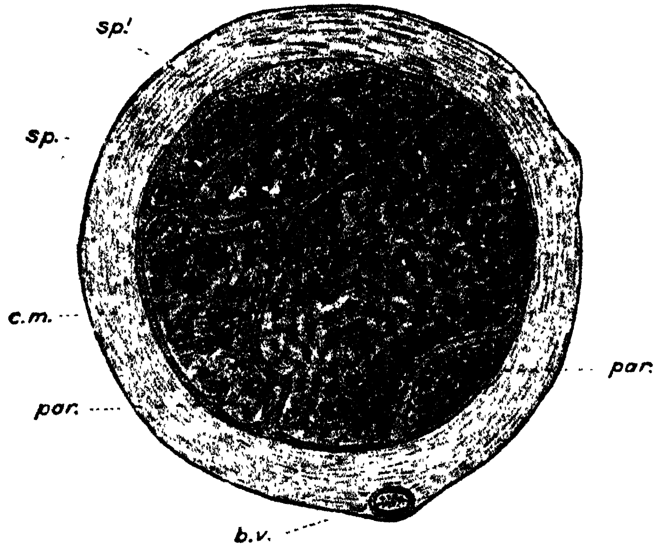


Transverse section of Leydig's gland and duct in region II of text-fig. 41.
(Lettering as in text-fig. 43.)

In region III of text-fig. 41 or region *a* of text-fig. 42 the horizontal partitions (*par.* in text-fig. 45) are cut rather obliquely, and the spaces between are occupied by spermatozoa aggregated apparently into spermatophores, with a sparse admixture of the secretion from Leydig's gland. In the passage (*sp.*) along the dorsal middle line of the cavity, the spermatozoa are free and in the condition found in the sperm-duct.

A section across the sperm-vesicle in region IV of text-fig. 41 or region *b* of text-fig. 42 presents the structure indicated in text-fig. 46 (p. 520). The spaces in the honeycomb of partitions contain widely separated spermatozoa floating freely in a fluid which is derived from Leydig's gland, and is pale green in fresh specimens. In the dorsal region is the structure *as.*—a continuation of the passage *sp.* above—containing small channels with one or other of which the cavities marked *lu.* in text-fig. 46 are connected. On the right side of the figure the last five ducts from the gland of Leydig are cut across (*m.s.'*).

Text fig. 45.

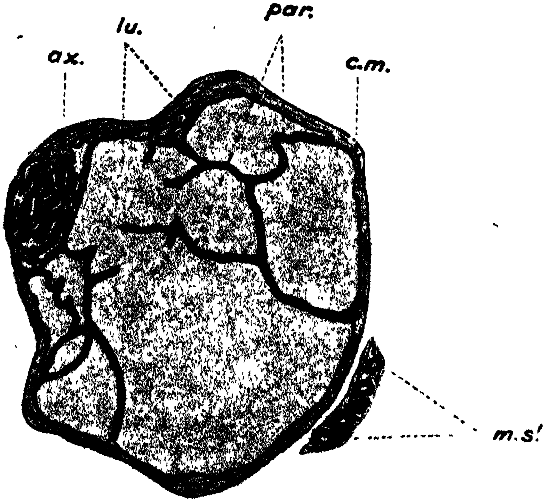


Transverse section of sperm-vesicle in region III of text-fig. 41.

b.v., blood-vessel; *c.m.*, circular layer of muscle fibres; *par.*, partitions projecting from sperm-vesicle wall; *sp.*, region where spermatozoa are free; *sp.'*, region where spermatozoa are collected into bundles.

In the next figure (text-fig. 47) a section in region V of text-fig. 41 or *c* of text-fig. 42 is shown with the structure *ax.* again present, with the wall of the vesicle much increased in thickness due to the presence of unstriped muscle-fibres and connective tissue, and with the collecting ducts *m.s.'* from Leydig's gland seen approximating to the structure *ax.* into which they ultimately open. In the vesicle wall now appear numerous diverticula *sp.''* containing loose free spermatozoa and nucleated material secreted by the gland of Leydig. Lastly, in the posterior region of the sperm-vesicle (marked VI in text-fig. 41) the structure *ax.* is absent, due to the dilatation of its channels, their fusion with one another, and the formation of a cavity into which the diverticula of the sperm-vesicle wall open (text-fig. 48). The diverticula contain peripherally (between the thick partitions) spermatozoa mixed with nucleated matter, whereas the central cavity contains free and widely separated spermatozoa floating in albuminous material in great abundance.

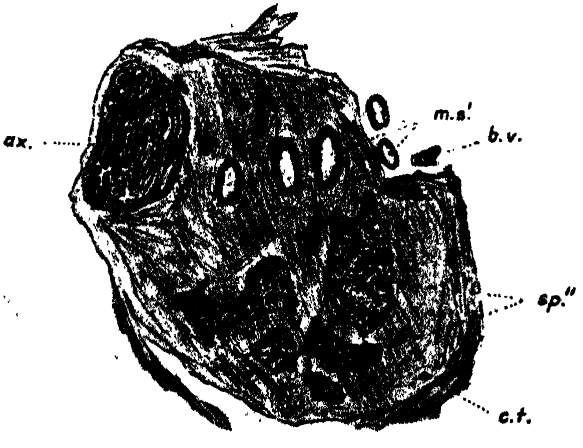
Text-fig. 46.



Transverse section of sperm-vesicle in region IV of text-fig. 41.

ax., main channel of the sperm-duct much divided up; *c.m.*, circular layer of muscle-fibres; *lu.*, cavities between the partitions, containing widely separated spermatozoa in a pale green fluid; *m.s.'*, the last five ducts passing from Leydig's gland to sperm-vesicle; *par.*, partitions projecting from the vesicle-wall in this region.

Text-fig. 47.

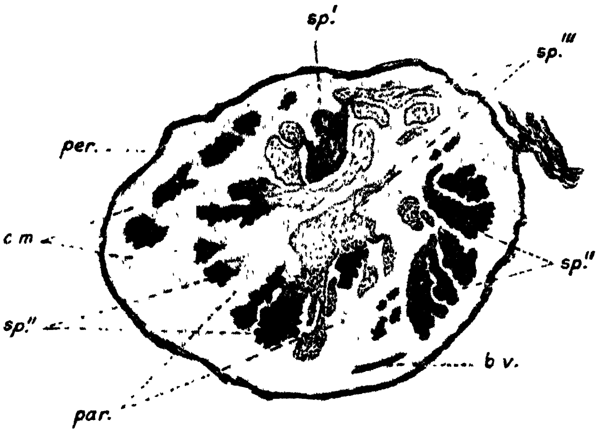


Transverse section of sperm-vesicle in region V of text-fig. 41.

ax., main channel of the sperm-duct much divided up; *b.v.*, blood-vessel; *c.t.*, connective tissue; *m.s.'*, ducts passing from Leydig's gland to sperm-vesicle; *sp.''*, diverticula filled with free spermatozoa mixed with a large amount of the secretion from Leydig's gland.

Briefly, then, it may be stated that the function of the anterior part of the sperm-vesicle is that of storing up the vast number of spermatozoa produced in the testis, and it is in this region that there are temporarily spermatophores. In the middle region (pale green), the spermatozoa are thoroughly mixed with the secretion of Leydig's gland, while the posterior part of the vesicle serves as a receptacle where the free spermatozoa are collected, and most probably also nourished, by the above secretion.

Text-fig. 48.



Transverse section of sperm-vesicle in region VI of text-fig. 41.

b.v., blood-vessel; *c.m.*, circular layer of muscle-fibres and connective tissue: *par.*, partitions giving rise to diverticula in the vesicle-wall; *per.*, peritoneum; *sp.'*, region containing numerous free spermatozoa, *sp.''*, diverticula where spermatozoa are found mixed with a large amount of secretion from Leydig's gland; *sp.'''*, region where the spermatozoa are very widely separated and mixed with albuminous material.

Sperm-sacs.—No trace of these structures is found, and this is to be expected if the sperm-sacs are formed from the lower ends of the Müllerian ducts (see Borcea, **13**), for the Müllerian ducts of the male *Chimæra* persist, although in an undeveloped condition (see below).

Urinary Organs.

The glands of Leydig pass posteriorly into the true kidney, which consists of right and left halves, partly separated by connective tissue in front, but completely fused behind into a median brownish-red structure situated dorsal to the ends of the seminal vesicles. The kidney ends posteriorly in a conical portion, which extends beyond the caudal limit of the abdominal cavity. It is drained by six pairs of ureters which open together into the urogenital sinus by two apertures situated behind those of the sperm-ducts (text fig. 42, *ur.o.*).

Histology.—In section the kidney presents typical excretory tubules (not so large as the tubules in Leydig's gland), with numerous well-developed glomeruli in the dorsal region. Moreover, the ureters do not contain nucleated material such as is found in the ducts draining Leydig's gland.

Urogenital Sinus.

The median rather narrow urogenital sinus receives the sperm-duct and urinary openings at its front end, and passes dorsal to the rectum to end in a flask-shaped, somewhat laterally compressed structure, into the ventral wall of which the ends of the Müllerian ducts pass close together. The sinus opens on the apex of a median papilla behind the anus, and between the bases of the posterior claspers. Hence the cloaca, usually found in male Elasmobranchs, is absent in *Chimæra*.

Two abdominal pores situated on the latero-posterior margins of the anus put the abdominal cavity in connection with the exterior.

Müllerian Ducts.

Mere traces of the Müllerian ducts are to be found persisting in most adult male Elasmobranchs, but the male *Chimæra* possesses them in the most perfect condition.

They appear as narrow tubes running between testis and coiled sperm-duct of each side, and further back, on the outer border of the sperm-vesicle; they end blindly behind in the wall of the urogenital sinus, but open into the cœlom anteriorly by slit-like openings, quite an inch apart, situated on the posterior surface of the wall dividing the pericardial cavity from the general body-cavity. No evidence was given by either young or old male specimens of a swelling on the Müllerian duct (figured by Redeke), in the region of the shell-gland of the female.

YOUNG MALE *CHIMÆRA MONSTROSA.*

The urogenital organs described below belonged to an animal measuring:—

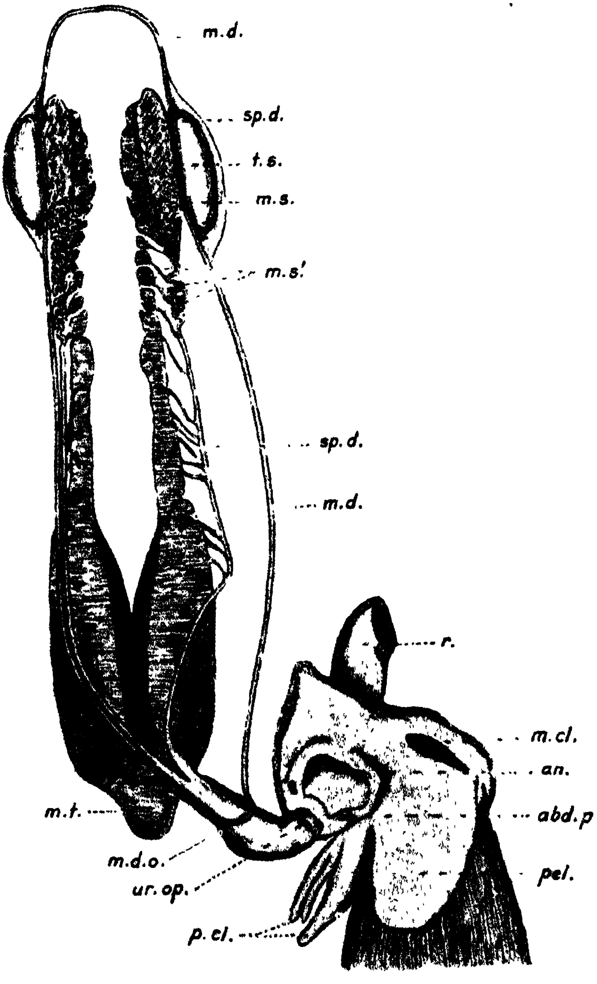
From snout to end of whip-like tail......	30 inches.
From snout to anal opening...............	8 ,,

Genital Organs.

The frontal clasper is indicated, but not yet free, on the head, and no spikes are yet in evidence. The middle claspers, in pouches in front of the pelvic fins, are supported by cartilage, but are without visible spikes, and only partially developed. The posterior claspers are already well-marked, and subdivided into two main portions, but the surface is still smooth.

The biconvex oval testes are closely similar in position and appearance to the gonads of the young female, but possess a

Text-fig. 49.



Dissection of the urogenital organs of a young male *Chimæra*, ventral view (nat. size).

abd.p., left abdominal pore; *an.*, anus; *m.cl.*, left middle clasper; *m.d.*, Müllerian duct; *m.d.o.*, region where *m.d.* passes into wall of urogenital sinus; *m.s.*, paired portion of kidney; *m.s.'*, collecting ducts from *m.s.*, opening into Leydig's duct; *m.t.*, fused unpaired portion of kidney; *p.cl.* left posterior clasper; *pel.*, left pelvic fin; *r.*, rectum; *sp.d.*, Leydig's duct; *t.s.*, left testis; *ur.op.*, urogenital opening.

smooth surface. They are invested with peritoneum, which also forms a ventral covering for the corresponding Müllerian duct, sperm-duct and kidney lying adjacent. In transverse sections it is possible to make out a number of efferent ducts passing into a collecting duct, which gradually passes into the coiled sperm-duct, and so the vasa efferentia and sperm-duct have the same relation as in the adult. No kidney tubules intervene, and the lining of the former (efferent ducts) imperceptibly passes into the lining found in the latter.

The anterior coiled end of each sperm-duct is, even at this period, much coiled and of greater size than the testes; at a level a little behind the latter it is but little coiled and rather wider, and then passes practically straight back along the outer border of the kidney until this joins its fellow of the other side, at which level it passes ventral to the now wide and deep kidney to fuse with the other sperm-duct in the middle line. It should be noticed that in its posterior region the sperm-duct is still of uniform diameter, the later changes to produce the seminal vesicle being not yet apparent; further, ducts pass off to the sperm-duct at intervals along the whole length of the paired portion of the kidney, with the possible exception of the first one or two segments. Behind, the unpaired kidney is drained by six ureters arising from either side, and opening separately, though very close together, into the respective sperm-ducts just before the latter fuse and open into the urogenital sinus.

Urinary Organs.

These consist of a posterior brownish unpaired portion representing the adult kidney, and two ribbon-like paired brownish bands, extending forwards to a level immediately in front of the testes, with regular segmentation, and short ducts passing into the sperm-ducts as described above. With the exception of the first one or two segments—which appear degenerate—the kidney possesses numerous glomeruli, as may be ascertained by staining and clearing in oil of cloves. Each segment of the kidney—and the segmentation, especially anteriorly, is very noticeable—apparently consists of much coiled tubules with two or three or even more glomeruli in the dorsal region. From the position and relations of the paired portions of the kidney, it is evident that later they loose their glomeruli and give rise to the glands of Leydig of the mature male adult.

Urogenital Sinus.

There is no trace of sperm-sacs, but the chamber formed by the fusion of the two sperm-ducts widens, and receives the two Müllerian ducts, which apparently pass in close together in the ventral middle line about half-way along its length. The Müllerian ducts are not in open connection, however, with the sinus, nor do they ever become so.

Müllerian Ducts.

At this stage the ducts of Müller surpass in diameter the sperm-ducts, and appear as tubes running in the peritoneum along the outer border of each half of the kidney, then between the testes and coiled sperm-ducts to meet anteriorly in the middle line, and open by a common aperture into the cœlom. Their lining is thrown into folds in some regions.

Abdominal pores, situated at the posterior margin of the anus, are both present and open.

ADULT FEMALE *CHIMÆRA MONSTROSA*.

In the adult condition the female *Chimæra* is somewhat larger than the male in size and general proportions. In all external characters (except in the absence of claspers) the female resembles the male, but differs from it in the possession of a longitudinal shallow groove in the ventral middle line of the body, a little distance behind the urogenital openings. This fleshy groove is bordered by skin white in appearance; it is lined with elongated glandular cells, extends for a distance of from 2½ to 3½ inches, and is nearly ⅛ inch deep. The urogenital organs—just as in the male—extend the whole length of the abdominal cavity and consist of two ovaries, two oviducts with shell-glands, kidney (paired and unpaired regions) with ureters and urinary bladder, and lastly, a median so-called "receptaculum seminis."

Genital Organs.

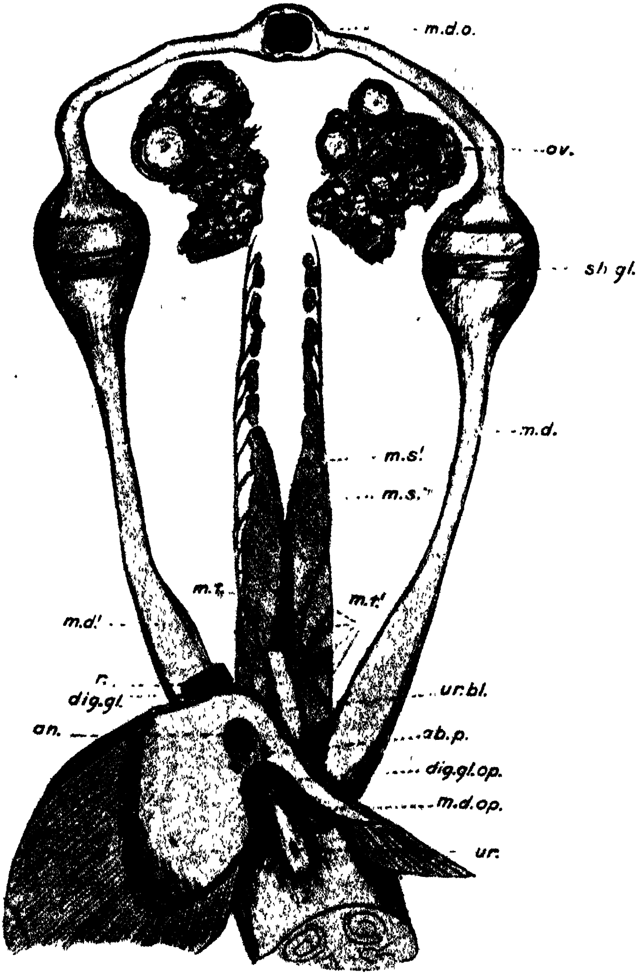
The two ovaries are situated one on each side of the dorsal middle line of the abdominal cavity, suspended by the mesovarium, and situated anterior to the front end of the kidney. Irregular in outline and easily ruptured, they present a lobulated appearance due to the Graafian follicles, some of which are very large (text-fig. 50).

The oviducts are extremely prominent tubes differentiated into regions, opening anteriorly on the posterior aspect of the pericardial wall and in front of the liver by a single large median cœlomic opening, by which the eggs liberated from the ovaries gain access to the oviducts. For the first one-third or one quarter of their length the oviducts are of comparatively small diameter, but then rapidly increase to form the shell-glands. These almost spherical structures are external to and at the level of the ovaries, and are lined by long glandular epithelial cells which are elevated to form a circular ridge on the inner surface of the wall; this ridge in a fresh specimen appears white against the rest of the wall of the gland.

The succeeding quarter of the oviduct resembles the first quarter in diameter, after which the oviduct gradually increases in width;

this posterior uterus-like one-third opening by a wide slit-like aperture, along with that of the other side, into a depression between the pelvic fins, and not into a urogenital sinus as is the

Text-fig. 50.



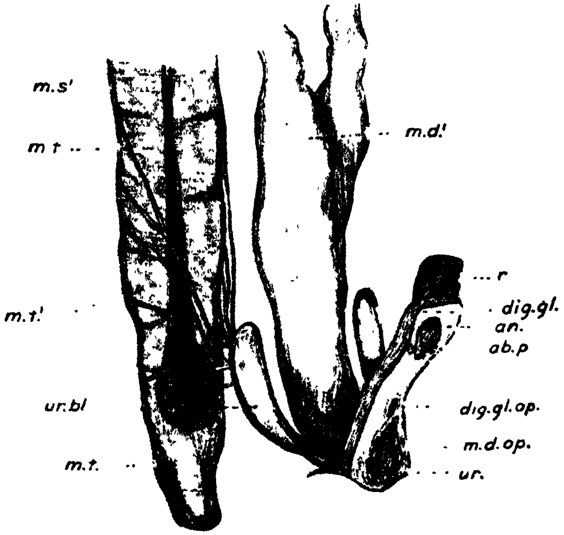
Urogenital organs of adult female *Chimæra*. Ventral view (× ½). The left pelvic fin has been almost entirely cut away.

ab.p., left abdominal pore; *an.*, anus; *dig.gl.*, digitiform gland; *dig.gl.op.*, its opening; *m.d.*, left oviduct; *m.d.op.*, left oviduct opening; *m.d.o.*, cœlomic opening of oviducts; *m.s.*, paired portion of kidney; *m.s.'*, longitudinal duct receiving collecting ducts from *m.s.*; *m.t.*, unpaired portion of kidney; *m.t.'*, special ureters from *m.t.*; *ov.*, left ovary; *r.*, cut rectum; *sh.gl.*, shell-gland of left ovary; *ur.*, opening of urinary bladder; *ur.bl.*, urinary bladder.

case in the immature female. Frequently the uterine portion of one or other or both of the oviducts is found everted from the genital opening.

The above oviducal slit-like openings are almost antero-posterior in position, and between them a rather wide ridge-like elevation is present with a single median urinary aperture near the posterior end of the ridge.

Text-fig. 51.



Dissection from right side of the posterior region of the urogenital organs of a female adult *Chimæra.*

ab.p., left abdominal pore; *an.*, anus; *dig.gl.*, digitiform gland. *dig.gl.op.*, its opening; *m.d.op.*, opening of left oviduct; *m.d'.*, uterine portion of right oviduct; *m.s.'*, longitudinal duct receiving collecting ducts from the paired portion of the kidney; *m.t.*, unpaired portion of kidney; *m.t.'*, special ureters from *m.t.*; *r.*, cut rectum; *ur.*, opening of urinary bladder, *ur.bl.*, urinary bladder.

Urinary Organs.

These consist—as in the young male and female of posterior unpaired and anterior paired portions. The latter are strap-shaped structures with indications of segmentation, especially anteriorly, where they diminish in size, the front end being situated about the level of the shell-glands and the posterior margin of the ovaries. By careful dissection the peritoneum covering the most anterior isolated segments may be removed, and they are then seen to lie on each side of the dorsal aorta. The paired portions of the urinary organ pass into a single median unpaired part behind, which is wide, deep, and triangular in section, with but little signs of segmentation, and terminated posteriorly by a conical portion, which projects caudalwards some distance behind the abdominal cavity. The paired and unpaired regions are of a uniform reddish-brown colour, and have glomeruli present throughout.

Short collecting ducts pass from the lower outer borders of the segments in front, and, at intervals, from the less segmented parts of the urinary organ behind, into a longitudinal duct running along the outer margin of the paired portions, this duct extending in the peritoneum anteriorly beyond the level of the kidney, and apparently becoming attenuated and ending blindly.

The longitudinal duct of each side passes, along with six ureters from each side of the unpaired urinary organ, to open dorsally by a right and a left opening into a median large urinary bladder. The region where these ducts open is about one-third of an inch from the front blind end of the bladder; the latter becomes somewhat narrower and opens behind the oviducal openings by a median aperture at the caudal end of the ridge-like elevation described above. Hence there is no cloaca, the only indication of such being the depression between the bases of the pelvic fins, where genital and urinary organs and intestine open.

It seems probable, having regard to the rudimentary nature of the front end of the urinary organ in the adult female, and the forward prolongation of the longitudinal collecting duct beyond it, and further, the fact that the kidney extends beyond the ovaries anteriorly in the immature female, that the front end of the adult female kidney has undergone degeneration.

The rectum opens separately and about an inch in front of the oviducal apertures; the anus has on its postero-lateral margins the abdominal pore openings, which have the same relations as in the male.

"*Receptaculum Seminis.*"

In the ventral middle line and almost mid-way between the anus and the urinary aperture, is an opening, quite prominent and just in front of the oviducal openings, which leads into a digitiform, thick muscular-walled sac, about an inch in length and called by writers from the time of Hyrtl "receptaculum seminis." A further study of this structure shows that the above name is misleading, and that a better term would be "digitiform gland." On examination no spermatozoa were found among its contents, but a fluid containing only globules and a large brown chitinous rod occupied the greater portion of its lumen. In all the adult females examined this rod was present, but no spermatozoa. The lining of this sac consists of long epithelial glandular cells.

YOUNG FEMALE *CHIMÆRA*.

The urogenital organs described below were taken from an animal measuring:—

From snout to tip of whip-like tail	27 inches.
From snout to anus	9 ,,

There are no external sexual characters beyond the presence of the ventral median groove behind the urinary opening, which in this immature animal is about two inches long.

Genital Organs.

The ovaries are slightly biconvex oval structures similar in size and position to the spermaries of the immature male, but having an uneven surface already, due to the presence of ova of varying size. They are intimately associated, by means of the covering peritoneum, with the oviducts in the region of the future shell-glands, but are on the outer sides of the oviducts, and not median to them as is the case in the adult.

The oviducts closely resemble the Müllerian ducts in the immature male, being almost uniform in diameter, and having a common median cœlomic opening in front, below the œsophagus. There is but a slight swelling in the shell-gland region, but further back the uterine swollen portion is already evident; the enlarged lower ends of the oviducts open separately into a median common urogenital sinus. Anteriorly the lining of the tubular oviducts is glandular and raised into longitudinal folds.

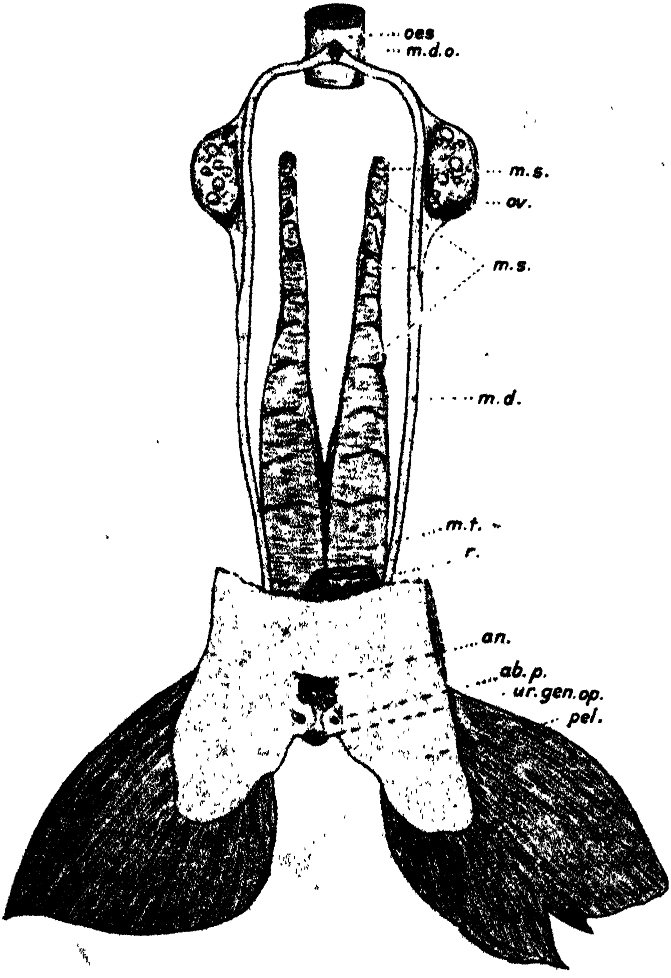
Urinary Organs.

The kidney is of a uniform brown colour, segmented in front, but less markedly so behind: it consists of right and left halves which are fused together for a short distance posteriorly, in which region the organ is triangular in cross section, whereas further forward each half is strap-shaped. Glomeruli are present in twos and threes or even more in each segment.

From the posterior outer border of each segment there passes off a short duct which joins a longitudinal collecting duct, which in turn arises at the front end of each half; these ducts open close together into a median urinary bladder as in the adult. Moreover, some five or six of these ducts, on each side of the posterior region of the kidney, delay their point of opening into the main longitudinal ducts and only pass in just before the latter reach the bladder: these become the special ureters in the mature animal.

In the female the attenuation of the kidney anteriorly is not so noticeable as in the young male, although sections show that the extreme front of the immature female kidney has lost its glomeruli and that its tubules are degenerating; and thus we find the kidney in the adult female not extending relatively so far forward in the abdominal cavity as it does in the young animal.

Text-fig. 52.

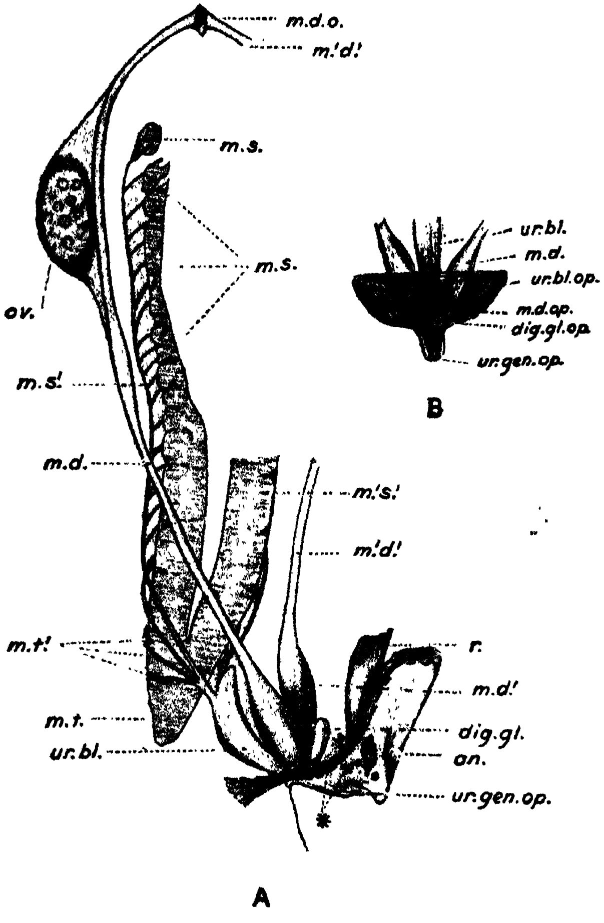


Urogenital organs of young female *Chimæra*. Ventral view (× 1).

ab.p., left abdominal pore; *an.*, anus; *m.d.*, left oviduct; *m.d.o.*, common cœlomic opening of oviducts; *m.s.*, paired portion of kidney; *m.t.*, unpaired portion of kidney; *oes.*, gullet; *ov.*, left ovary; *pel.*, left pelvic fin; *r.*, cut rectum; *ur.gen. op.*, opening of urogenital sinus.

As in the young male and the adult female, the entire kidney of the young female (except perhaps the extreme front end) is excretory.

Text-fig. 53.



A. Urogenital organs of young female *Chimæra* dissected from right side. Some parts of the left side have been removed.

B. Dissection of urogenital sinus of the above. The sinus has been opened, to show the apertures in its wall, by a dorsal posterior median incision.

*, bristle passed through right abdominal pore; *an.*, anus; *dig.gl.*, digitiform gland; *dig.gl.op.*, opening of *dig.gl.* into urogenital sinus; *m.d.*, right oviduct; *m.d.'*, uterine portion of left oviduct; *m.'d.'*, left oviduct; *m.d.op.*, opening of right oviduct into urogenital sinus; *m.d.o.*, cœlomic opening of oviducts; *m.s.*, paired portion of kidney on right side; *m.s.'*, longitudinal duct receiving collecting ducts from *m.s.*; *m.'s.'*, paired portion of kidney on left side partly removed; *m.t.*, unpaired portion of kidney; *m.t.'*, special ureters from *m.t.*; *ov.*, right ovary; *r.*, cut rectum; *ur.bl.*, urinary bladder; *ur.bl.op.*, its opening into urogenital sinus; *ur.gen.op.*, opening of urogenital sinus.

Receptaculum Seminis.

This is a diverticulum situated ventral to the oviducts and between them and the rectum. Its lining is glandular and it opens into the urogenital sinus by a median opening in front of the oviducal openings. The rod-like chitinous structure present in all adult females is absent, and so has not yet been secreted by its lining.

Urogenital Sinus.

This structure is well-marked in the young female: it receives in front the opening of the "receptaculum seminis," then the two oviducts open laterally further back, but a little in front of the median smaller aperture of the urinary bladder. The sinus opens on a median papilla situated a short distance behind the anus, and reminds one of the urogenital aperture of the male in appearance and position.

In the further development of the female the urogenital sinus opening gets larger and larger until the sinus is represented in the adult merely by a depression with two deep pouches bordering the oviducal openings anteriorly.

The anus and abdominal pores do not differ from the condition found in the adult.

A young female *Callorhynchus* I examined by means of sections (kidney lent to me by Prof. W. N. Parker) showed the same general arrangement of the urogenital organs.

The ovaries are comparatively short and the kidney extends further forwards. The oviducts have a single median opening into the cœlom, a uniform diameter throughout, with no swollen uterine portion at this stage, and open separately immediately dorsal to the anus into a distinct cloaca. There is no sign of a "receptaculum seminis" or urogenital sinus. The abdominal pores are imperforate as yet.

The kidney possesses glomeruli throughout: it is at this stage of uniform section, and the main ureter on each side receives about four small ducts from each half of the kidney in front; the remaining five to seven small ducts from each side are posterior and enter the bladder along with the main ureter.

SUMMARY AND CONCLUSIONS.

The following points relating to the above description deserve special notice:—

(1) The urinary organ of the young male differentiates in the adult into anterior paired Leydig's glands and posterior unpaired kidney.

(2) The glands of Leydig do not function as a renal organ as is shown by their histology and the contents of their ducts; further, the condition of the spermatozoa at intervals in the long coiled sperm-ducts (Leydig's ducts) renders it probable that the

function of the glands of Leydig is the secreting of a fluid for giving nutrition to the spermatozoa.

(3) The sexual kidney or "Geschlechtsniere" is represented in the adult male only by the rete testes, efferent ducts, and longitudinal collecting duct. Moreover, an epididymis, as usually defined, is absent.

(4) The development of the glands of Leydig is accompanied by changes in the sperm-ducts, and the formation of highly complex sperm-vesicles.

(5) The anterior region of the urinary organ undergoes a retrograde development, as is shown by a comparison of this structure in the immature and adult females.

(6) There is a distinct urogenital sinus in the young female, which does not persist in the adult.

(7) The application of the term "receptaculum seminis" to the digitiform gland found ventral to the urinary bladder is erroneous, and this structure must for the present be regarded as a female accessory genital gland of obscure function.

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March 15, 1910.

E. T. NEWTON, Esq., F.R.S., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1910:—

The number of registered additions to the Society's Menagerie during the month of February last was 80. Of these 28 were acquired by presentation, 16 by purchase, 7 were received on deposit, 17 in exchange, and 12 were born in the Gardens.

The number of departures during the same period, by deaths and removals, was 165.

Amongst the additions special attention may be directed to:—

One Mandrill (*Papio maimon*), from West Africa, presented by Dr. A. S. Griffith on Feb. 24th.

Two Bennett's Gazelles (*Gazella bennetti*), from the Isle of Hormuz, Persian Gulf, and one Punjaub Wild Sheep (*Ovis vignei*), from Banda Abbas, Persia, presented by B. T. Ffinch, Esq., F.Z.S., and F. W. Townsend, Esq., on Feb. 22nd.

Two Painted Finches (*Emblema picta*), from N.W. Australia, new to the Collection, received in exchange on Feb. 25th.

Two Black-hooded Parrakeets (*Psephotus cucullatus*), from N.W. Australia, new to the Collection, received in exchange on Feb. 28th.

One White-quilled Rock-Dove (*Petraphassa albipennis*), from Australia, new to the Collection deposited on Feb. 24th.

Post-mortem Phenomena in a Lemur.

The Secretary read the following account, by E. W. Shann, B.Sc., of the Gatty Marine Laboratory, St. Andrews, of some post-mortem phenomena observed in a Lemur.

Early in the morning of February 23rd, 1910, a specimen of *Lemur fulvus rufifrons* was found apparently dead in its cage in the Zoological Gardens at Giza, Egypt. The specimen had been kept in the Gardens for upwards of nine years. At 9 A.M. the animal was examined by Mr. M. J. Nicoll, Assistant Director. It was lying limp on the sand, for the limbs had not stiffened. At irregular intervals the mouth opened slightly, and an almost imperceptible motion passed through the thoracic region. Mr. Nicoll says that lemurs and some monkeys not infrequently undergo a more or less protracted moribund condition before death actually occurs. This is particularly the case with old specimens, and no case is known in which the animal has recovered from this condition.

At 11 A.M. Capt. S. S. Flower, Director, gave the lemur to the present writer for the purpose of dissection. By this time there was no movement of the jaws, but the limbs were still limp. After a few minutes the gasping recommenced. This may have been due to the warmth of the hand. Dissection was postponed, and Mr. Nicoll tried the effects of artificial respiration. The gasping became more frequent, and at fairly regular intervals of 40 50 seconds. No heart action could be detected. The spasmodic movements again died away. The eyes had a glazed appearance, but as the animal had been blind for a considerable period, this was no clue to its condition.

At 2 P.M. the eyelids were found to be closed, and there was no movement of the jaws. Dissection was commenced. It was observed that the blood flowed slowly from a slit in the jugular vein; that is to say, the blood was not congealed. The limbs were still limp. On opening the costal region a muscular contraction of the heart was noticed. After touching the heart with the handle of a scalpel further contractions took place, and continued for more than a minute. At 4 P.M. this heart action was observed by Capt. Flower. The dissected lemur was then left, covered with a damp cloth, till 6.30 P.M. when it was again examined by Capt. Flower, Mr. Nicoll, and the writer. The muscular contractions of the heart were very evident, though the limbs were rigid by this time. Further observations were made at 9 P.M., 10.15 P.M., 11.15 P.M., and 1 A.M., the following day. The contractions could be easily induced, but later the response became feebler. At 8.30 A.M.—a whole day after the apparent death of the animal—a slight muscular action could still be induced in the auricles, but no longer in the ventricles. By 2 P.M. all motion had ceased. No means were at hand for testing the effect of electricity upon the organ in question.

That this is a case of reflex action seems to be the probable conclusion; for, at least in the later phases, the animal was dead, in the generally accepted sense of the word.

A new Potto from British East Africa.[*]

Mr. Oldfield Thomas, F.R.S., F.Z.S., exhibited the skin of a Potto which had been obtained in British East Africa, the first specimen from elsewhere than on the West Coast of Africa received by the National Museum.

The species was quite distinct from the western forms, and was proposed to be called—

Perodicticus ibeanus Thos.[†]

Abstract P. Z. S. 1910, p. 17 (March 22nd).

A long-haired Potto, blackish anteriorly, grey posteriorly.

Size about as in the Gaboon *P. batesi* de Wint. Fur soft and thick, the wool-hair on the back nearly 20 mm. in length, and the straight hairs 25–26 mm. General colour grizzled ashy, but the shoulders and fore-back blackish, the contrast between the two colours very marked. Head brownish clay-colour, the extreme tips of the hairs blackish; these dark tips broadening posteriorly so as to make the nape and fore-quarters almost black, with a hidden suffusion of dark clay colour. The long bristle hairs of the crown and nape black. Rest of the body, behind the withers, grizzled ashy, the longer hairs dark with greyish-white tips, the woolly underfur dark slaty basally, then broadly clay-coloured, and with dark tips. Under-surface greyish, not sharply defined, the hairs slaty basally, dull greyish white terminally (grey no. 8). Arms and legs grizzled ashy like the body; hands and feet buffy brownish. Tail comparatively long, cylindrical, ashy grey.

Skull about as large as in *P. batesi*, but the teeth small as in *P. potto*. Nasals very short.

Canines rather slender. Anterior premolar long, pointed, two-thirds the height of the canine. Other cheek teeth all very small; second molar smaller than the first. Anterior lower premolar longer than posterior.

Dimensions of the type, measured in flesh:—

Head and body 339 mm.; tail 68; hind-foot 76; ear 25.

Skull—upper length 64 mm.; basal length 55; greatest breadth 46; nasals 14·2 × 5·3; interorbital space 9·3; length of cheek-tooth series 16·5; of molars only 8·5; breadth of m^1 3·8, of m^2 3·2.

Hab. Kakamega Forest, near Mount Elgon, British East Africa, alt. 6000′.

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[*] Published by permission of the Trustees of the British Museum.

[†] [The complete account of the new species appears here, but the name and a preliminary diagnosis were published in the 'Abstract,' No. 81, 1910.—Editor.]

Type. Young adult male. B. M. No. 10.3.18.1. Original number 515. Killed 4th Jan., 1910. Presented by Messrs. Maturin and Brett through Mr. R. Kemp.

This fine species of Potto was no doubt that from Uganda mentioned by Sir Harry Johnston [*], and, with the exception of that mention, represented a considerable extension of the known range of *Perodicticus*, the genus having been otherwise recorded only from the West Coast.

P. ibeanus was at once distinguishable from all others by the hoary colour of its back, which contrasted markedly with its blackish shoulders, the difference being due to the long hairs of the former being broadly tipped with ashy, a character not found in any other Potto. Its coat also was of an unusually soft rich nature, in agreement with the considerable elevation of its habitat.

The specimen had been given by Messrs. Maturin and Brett to Mr. R. Kemp, who was collecting for the National Museum on behalf of Mr. C. D. Rudd.

Mr. D. Seth-Smith, F.Z.S., M.B.O.U., Curator of Birds, communicated the following account of some living examples, in the Society's Gardens, of the Black-hooded Parrakeet (*Psephotus cucullatus* North):—

The Society has recently acquired by exchange a pair of Parrakeets of the genus *Psephotus*, which were originally obtained from Mr. A. E. Jamrach, who informs me that in all ten pairs arrived in Europe some few months since. These birds were at first believed to be Golden-shouldered Parrakeets (*Psephotus chrysopterygius*), and a pair was shown at a recent bird-show at the Crystal Palace under this name. In examining the pair, however, I noticed that the male bird lacked the yellow frontal band characteristic of that species, and that the black marking on the head extended to the base of the bill, over the lores and completely surrounded the eye; and moreover, the yellow patch on the wings appeared to be more extensive than in *P. chrysopterygius*. I thought at first that these birds were referable to a species described in the P. Z. S. of 1898 by Professor Collett as *Psephotus dissimilis*, but on looking up the description of these I found that the crown is chestnut according to Collett and dark brown according to Hartert[†]. I have since discovered a reference to this black-crowned form in the 'Victorian Naturalist' for 1909, where Mr. North publishes a note, dated Feb. 6, 1909, on these birds, probably the very lot of which the Society's pair formed part.

They were captured by Mr. Fritz Kruger in the Northern Territory of South Australia, 200 miles south-east of Port Darwin, which is the locality *P. dissimilis* is said to inhabit.

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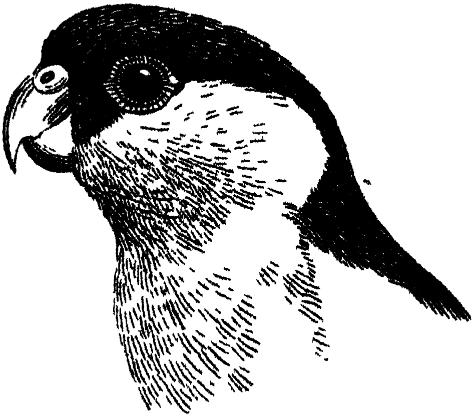
[*] 'Uganda,' vol. i. p. 364, 1902.

[†] Nov. Zool. vol. xii. p. 214 (1905).

Mr. North examined them on their arrival in Sydney, and at first believed them to belong to that species, but subsequently noticed the characters to which I have referred. He was able to examine no less than sixteen specimens, five of which were adult males entirely lacking all trace of the brown frontal band that characterises *P. dissimilis*.

He writes, "What I regard as the chief point of difference is that not only are the lores, forehead and crown of the head of the adult male *black*, but that this colour extends down the anterior portion of the cheeks to the base of the lower mandible. Viewed in front, the bird appears to wear a black mask or cowl. Should it prove to be distinct I propose to distinguish it under the name of *Psephotus cucullatus*, and vernacularly as the Black-hooded Parrakeet."

Text-fig. 54.



Head of *Psephotus cucullatus* North.

In the Society's pair of birds the male is rather rough in plumage at present, but shows quite distinctly the characters above described, and I think there is no doubt that Mr. North is right in ascribing this to a new species.

The female of *P. cucullatus* lacks any trace of the yellowish frontal band which is present in the female of *P. chrysopterygius*; but it agrees fairly well with Professor Collett's description of *P. dissimilis*.

The recent consignment of these Parrakeets does not appear to be the first arrival of *P. cucullatus* in Europe, for Mr. Blaauw informs me that he has some specimens in his aviary at Hilversum, Holland, which he received last summer. Moreover, a pair of birds received alive by Mrs. Johnstone, of Burrswood, Groombridge, so long ago as 1902 or 1903, of which the skin of the female is in my possession, and that of the male in the possession of Mr. Fasey, of Snaresbrook, Essex, undoubtedly belong to the race recently described by Mr. North.

The Secretary read the following letter which had been sent him by Mr. George Jennison, of the Zoological Gardens, Belle Vue, Manchester:—

"We attribute our success in breeding Pine Snakes solely to the provision of a suitable habitat.

"The adults were turned into our large snake cage in the beginning of June, and evinced such a desire to enter the conservatory, which for purposes of atmosphere forms part of the cage, that we gratified them by making a small hole through which they could pass.

"Some of the boas show a similar preference for the conservatory, but to nothing like the same extent as the Pine Snakes.

"They revelled in the rank vegetation and speedily disappeared below ground in burrows probably of their own construction. There among the soil, which has a temperature of 90° or so, they perfected their family arrangements.

"Their success came to us somewhat as a dramatic surprise.

"On October 18th, a Pine Snake 13 inches long was discovered on the floor of the greenhouse which adjoins the snake cage.

"It had passed between the slates that form the bed of the conservatory down among the heating pipes where the temperature would be 100° or more, and thence through a well-worn opening about the size of a mouse hole to the place where it was found.

"Seven or eight snakes were collected during the next few days, several being among the heating pipes. All were very lively and in excellent condition. They were similar in colour and pattern to the parents.

"Four we put in a cage apart, and the keeper Craythorne says he saw them on several occasions take worms, but they were obviously not doing as well as those left to their own resources, so we returned them to the old home where they immediately disappeared under the soil. Burrowing to such an extent, they are rarely seen, but a specimen captured in good condition on March 7th measured 16½ inches, a growth of 3½ inches in about four months.

"We have no knowledge of the number of the brood nor one may say of their distribution, as they have been found in good order in our temperate greenhouse twenty yards from their birthplace."

Mr. Charles Sillem exhibited some living specimens of the Crustacean *Chirocephalus diaphanus* recently caught in a flooded ditch on Eton Wick Common.

The following papers were read:—

1. A Contribution to the Skeletal Anatomy of the Frilled Shark, *Chlamydoselachus anguineus* Gar. By T. Goodey, M.Sc. (Birm.), Research Scholar, University of Birmingham *.

[Received February 14, 1910.]

(Plates XLII.-XLVI.†)

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  c. First and second Visceral Arches, Ligaments and Muscles.
  d. Branchial Arches.
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I. Introduction.

The present paper is the outcome of a piece of research, carried out in the Zoological Laboratory of the University of Birmingham, on the skeletal anatomy of the primitive Selachian *Chlamydoselachus anguineus.*

The work was suggested by the late Prof. Bridge, and a large part of it, that dealing with the skull and vertebral column, was carried out under his supervision. I should like here to say how much I appreciate the opportunity of using such valuable material, and to express my gratitude for the helpful criticism which my late teacher was always willing to give. The material included one perfectly complete male specimen, the greater part of a large female specimen, and the remains of another male, which was principally in the form of parts set up as museum specimens.

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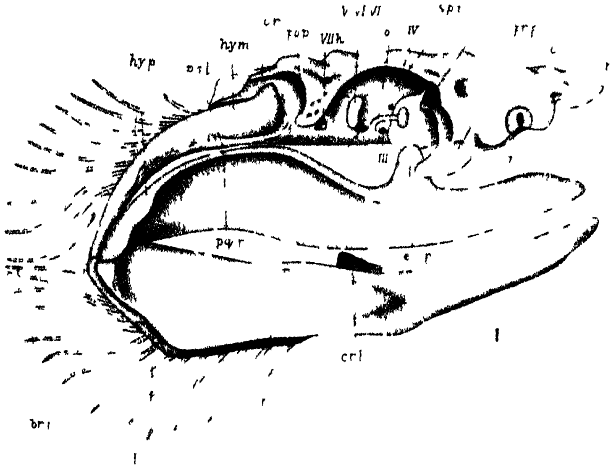
* Communicated by Dr. P. Chalmers Mitchell, M.A., F.R.S.

† For explanation of the Plates see page 570.



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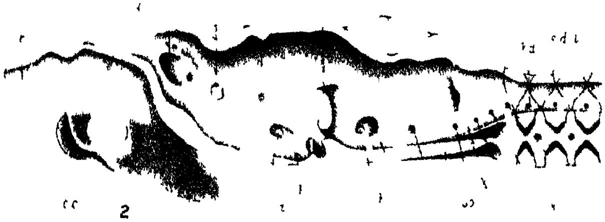

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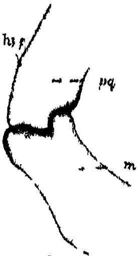

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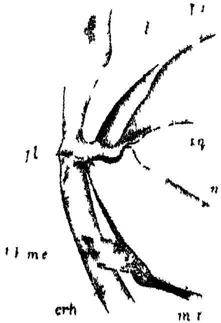

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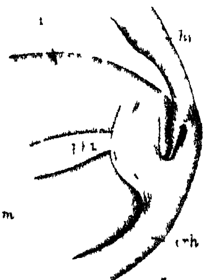

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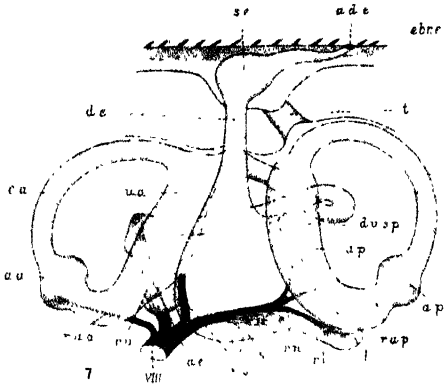

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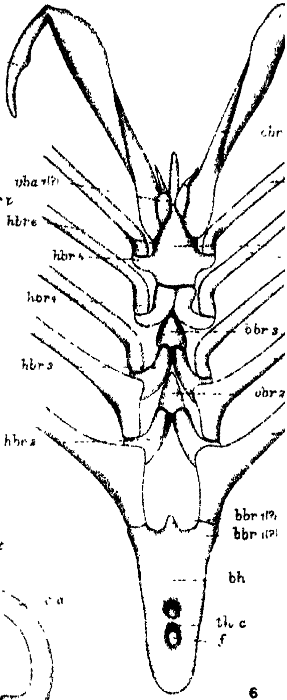

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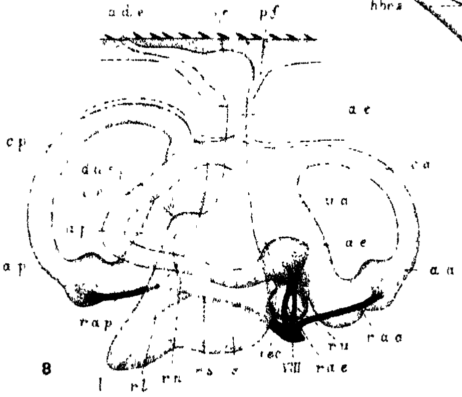

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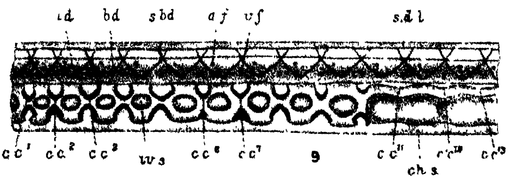

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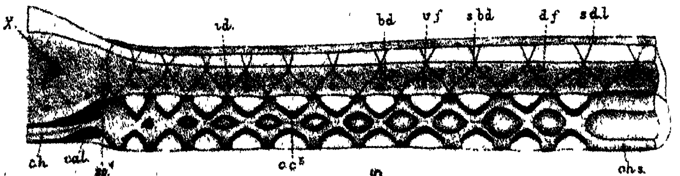

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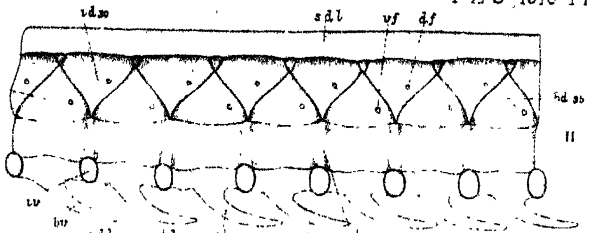

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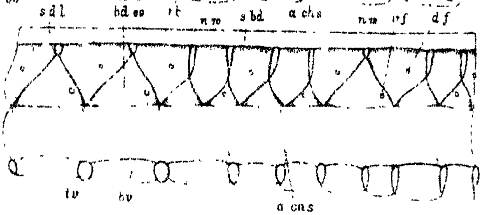

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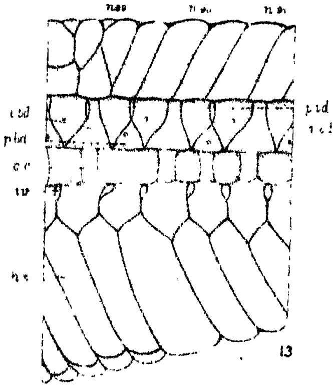

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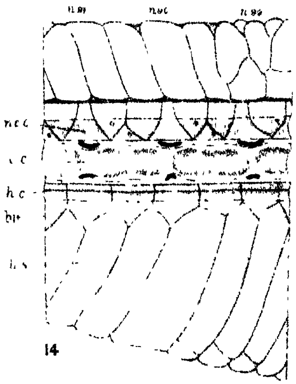

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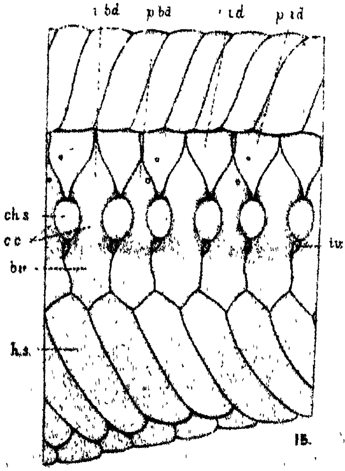

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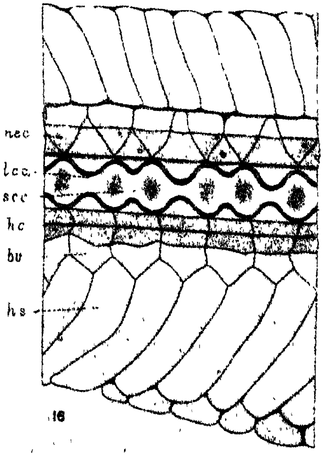

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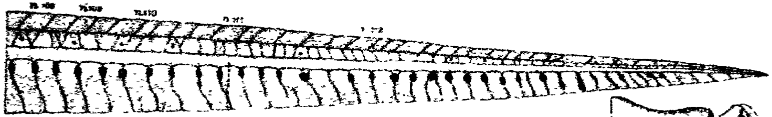
P. Z. S. 1910, Pl. XLV.



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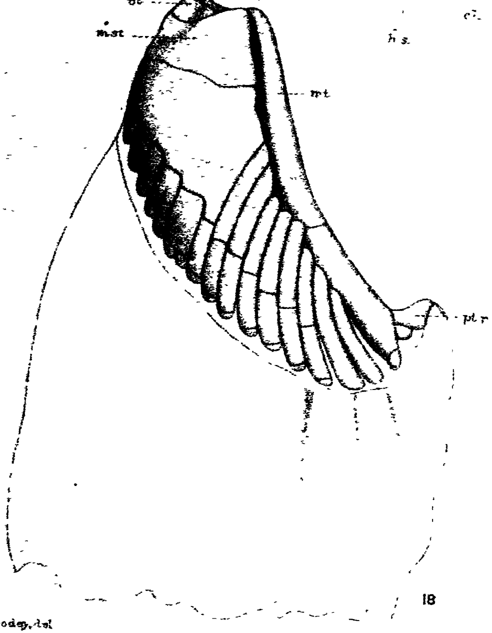

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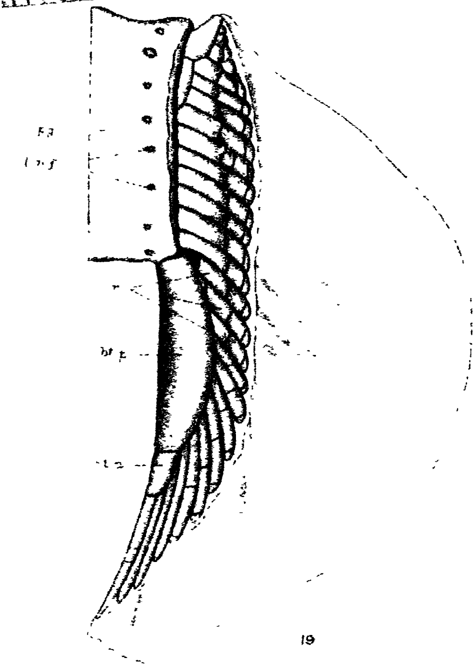

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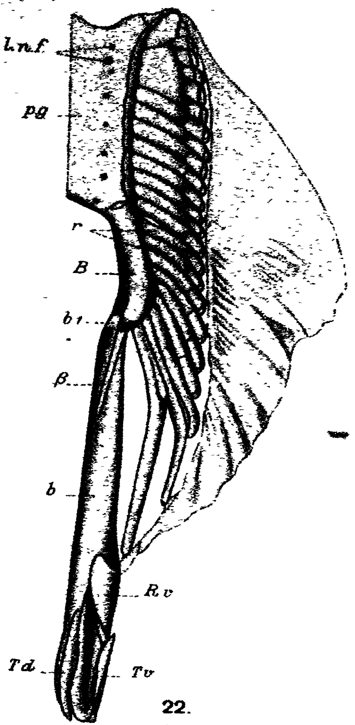
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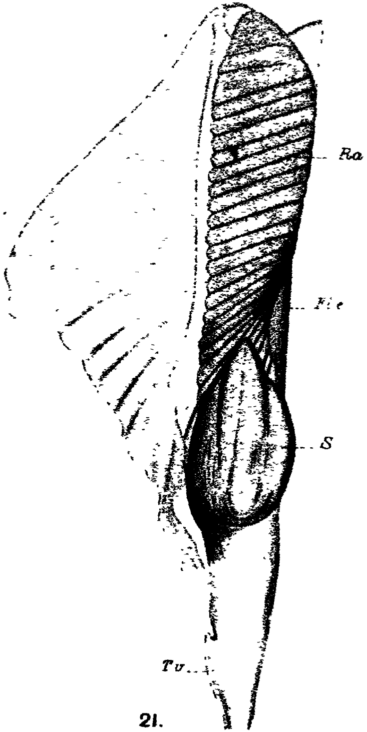
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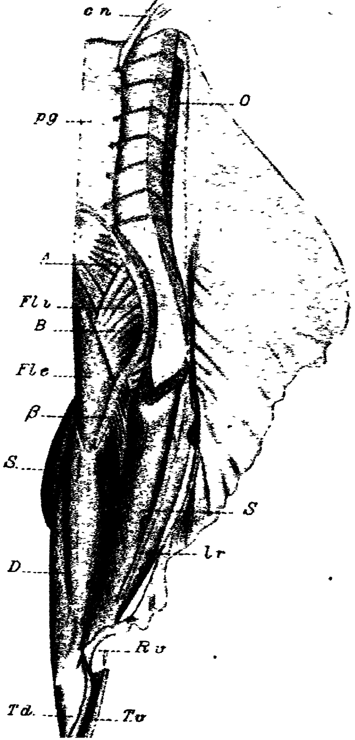
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There are several reasons why a detailed knowledge of this fish is especially desirable. In the first place, *Chlamydoselachus anguineus* is admittedly a primitive member of the Selachian group of fishes, and by virtue of its position, it demands a more considerable knowledge of its structure and anatomy than would be the case were it a member of one of the higher and more specialized groups of Selachians. Furthermore, the original account of the fish given by Garman (**10**) is in many parts very limited and indefinite, whilst the figures are rather indistinct and in a few cases inaccurate. Little work has been carried out on the anatomy of the skeleton since the publication of this paper. Günther (**14**) has dealt with the skeleton of the mixipterygia and with the abdominal viscera. Braus (**2** & **3**) has dealt with the pelvic plexus in the earlier of the two papers, and in the second one has given a short comparative account of the pectoral girdle and fin and of the mixipterygia. Furbringer (**6**) has described the labial cartilages and the vestigial seventh branchial arch, which were not discovered by Garman.

In addition to these, there is a paper by Ayres (**1**) on the comparative anatomy of the arterial system, and two papers by Hawkes (**16** & **17**), the first on the cranial and spinal nerves, and the second on the abdominal viscera and the vestigial seventh branchial arch.

My best thanks are also due to Prof. Gamble for many helpful suggestions during the progress of the work since the death of Prof. Bridge.

II. MEASUREMENTS.

I give certain measurements which may be of service as indicating the size of the specimens examined and also as perhaps denoting in an indirect way their comparative age.

Total length, 52 ins. (Garman's specimen 59·5 ins. Gunther's 58 ins.).

Snout to angle of mouth	3·5 ins.
„ to end of gill covers	7·7 „
„ to end of left pectoral fin	11 „
„ to base of pelvic girdle	25·5 „
„ to anus	27 „
„ to base of anal fin	31·8 „
„ to end of anal fin	38·8 „
„ to base of dorsal fin	32·5 „
„ to end of dorsal fin	38 „
Greatest depth of caudal fin	3·7 „
Width across anal and dorsal fins	4·8 „
Width across eyes	2·8 „

Tail of large female specimen referred to in paper.

Length of tail from root of caudal fin to tip	18 ins.
Greatest depth of caudal fin	5 „

III. The Skull, Visceral Arches, etc.

(Plates XLII., XLIII. figs. 1–6.)

My observations on two skulls agree in the more important points with the description given by Garman (10) pp. 7–9. It is not my intention in the present account to redescribe the whole of the structure, but rather to amplify the original description in those points which appear to call for special emphasis, and to make certain additions. I propose to deal first with the cranium, then with the first and second visceral arches and their ligaments, and finally with the branchial skeleton and certain other points.

a. *Cranium* (fig. 1).

At the extreme anterior end of the cranium is the broad, flat, and somewhat rounded rostrum (*r.*), which is notched at its sides. Its shape gives to the nasal region a curious truncated appearance. The olfactory capsules (*o.c.*) are large, rounded, and thin-walled. Their large apertures have the nasal cartilages (*n c.*) fitting into them. Each of these is ring-like and has a bar across the middle of the aperture so as to give rise to the double opening which each capsule presents in external appearance.

The anterior fontanelle (*a.f.*) is very large and broad, extending posteriorly to a point almost level with the preorbital process. Immediately behind the olfactory capsule is a deep furrow which communicates above with the foramen transmitting the ophthalmicus branch of the seventh nerve, and in which are found branches of the latter nerve. Posterior to this furrow is a somewhat prominent ridge having a sharp edge orbitally, and gradually running into the tapering backwardly directed preorbital process below. On the anterior side of the orbit is a very smooth, hollow surface, against which the eyeball rolls. On the cranial wall at the anterior end of the orbit is developed a rather prominent articular surface which receives the inner side of the ethmopalatine process of the palatoquadrate cartilage.

The supraorbital ridge is somewhat thin and prominent. In the shallow groove along its dorsal surface are a number of foramina which transmit branches of the ophthalmicus branch of the seventh nerve supplying the supraorbital sensory canal.

Garman described the postorbital process (*po.p.*) as of irregular shape and moderate breadth. In the specimen which I have examined it appears to be quite regular in outline. It is a backwardly curved, stoutish process, gradually tapering towards its rounded end. On its upper surface are found a number of foramina which also transmit branches of the seventh nerve to the sensory canal-system.

From the median vertical longitudinal section of the cranium (fig. 2), it is seen that the notochord is continued as a thin strand of tissue in the basis cranii as far forward as the pituitary fossa.

The cartilage of the floor of the cranium in the region of its junction with the vertebral column is thick and somewhat heavily calcified. It here shows some indication of its probable vertebral nature, by the slight resemblance which the calcification presents to the inverted **V**-formation found in the centra of the vertebral column.

The nerve foramina, as seen both from the inside and from the outside of the skull, deserve some consideration. The foramen for the first nerve (I.) is very large and lies just below the opening of the anterior fontanelle. The optic nerve foramen (II.) is moderately large and, seen from the inside, lies a short distance posterior to the opening for the olfactory nerve. On the outside it opens into a deep channel on the anterior dorsal side of the smooth articular surface which receives the ethmo-palatine process of the palatoquadrate. It is thus situated comparatively far forward in the orbit.

The foramen for the third nerve (III.) lies at the end of a forwardly curved groove on the inside of the skull. Externally it is placed close to the floor of the cranium just behind the posterior ridge of the above mentioned articular surface.

The aperture for the fourth nerve (IV.) is small and lies well up in the orbit, almost vertically above (III.). Behind foramen III. is the cartilaginous optic stalk (*o.s.*), against the expanded end of which the back of the eyeball rests. Immediately posterior to the origin of this stalk is a fairly large foramen which transmits the interorbital blood-sinus. On the inside of the skull, it is divided by means of a thin, outwardly directed cartilaginous bridge. The interorbital sinus passes posterior to this, whilst the cavity anterior to it forms the pituitary fossa. The foramen of the internal carotid artery (*i.c.f.*) is a small aperture lying in the floor of the skull immediately anterior to the pituitary fossa.

Nerves five, six, and seven are transmitted by a very large foramen (V. VI. & VII.) which is about twice as long as broad, and has a thin, backwardly directed ridge on its anterior edge. Following this is a double foramen (VII. & VIII.) on the inside of the skull, which transmits the hyoidean branch of the seventh nerve and also nerve eight. The hyoidean part is the anterior smaller portion, which is continued directly outwards and opens externally just beneath the postorbital process. The foramen for nerve nine is small and is somewhat ventrally placed a short distance posterior to foramen VIII. It is continued obliquely under the auditory capsule and opens externally at the back of the cranium in a very deep depression, overhung by the occipital ridges.

The tenth foramen is moderately large and on the inside is situated in the median line. It opens externally at the back of the skull just above the aperture for the ninth nerve. There are four small foramina, somewhat ventrally placed, the first one lying immediately below foramen X. These are the foramina of the spino-occipital nerves, *so*^{1} *so*^{4}.

b. *Labial Cartilages.*

These were not found by Garman, but Furbringer (6) has described and figured them, and my observations agree well with his. On each side of the head there are three small, rod-like cartilages, two dorsal and one ventral to the mouth. The ventral one is the longest and meets the posterior dorsal one at the point of the angle of the mouth where both are united by ligament. The dorsal one of this pair is about two-thirds the length of the ventral one and is somewhat inwardly directed. The anterior dorsal one is distinct from those just described. It lies at the posterior end of a ligament which stretches beneath the orbit from the outer ridge of the preorbital process to a point beneath the postorbital process. It is very thin and at its anterior end is also inwardly directed.

c. *First and Second Visceral Arches, Ligaments and Muscles.*

The suspension of the jaws is hyostylic. At its proximal end the hyomandibular articulates with a rather deep concavity on the auditory capsule. As Garman has pointed out, this articulation does not take place with the whole of the head of the hyomandibular, the latter having an oblique disposition to the skull. Thus, only the knob on the posterior side is in contact with the skull, and between the projecting anterior knob and the concavity there is a thick pad of capsular ligament. Garman has also given an accurate description of the general shape and disposition of the hyomandibular. It is suspended in a backward and downward direction at an angle of about forty degrees from the skull by a strong ligament which has its origin on the ventro-lateral surface of the auditory capsule. The ligament is attached to this region for some considerable distance, and from here proceeds obliquely backward. It lies internal and ventral to the hyomandibular, to which it is attached on the inner side at about one-half the length of the cartilage from the skull. It is post-spiracular in position and corresponds with the inferior post-spiracular ligament found in the Common Dogfish, *Scyllium canicula*, as described by Ridewood (27). There is no pre-spiracular ligament in *Chlamydoselachus*, and I agree with Garman in not finding a spiracular cartilage, though Fürbringer (6) has described and figured as one a minute piece of cartilage which shows hyaline structure in microscopic sections. I have little to add to Garman's account of the upper and lower jaws; my observations confirm their shape and disposition as recorded by him.

The joint between these two cartilages is a very interesting one, and was not dealt with in the original description. It is visible only when the jaws are opened to their widest extent (fig. 3). There are two articulations, each of the cup and ball type, one on the outer and one on the inner side of the joint. On the outer or posterior articulation the quadrate forms a broad, rather flattened knob which fits into a slight concavity of the posterior and outer end of the mandible. The inner or anterior articulation is formed by a prominent rounded protuberance – somewhat more than half the width of the one on the quadrate – which projects upwards into a corresponding concavity or facet in the quadrate.

This joint affords a resemblance with *Heptanchus*, the corresponding joint in which has been worked out by Gadow (8). There is the difference, however, that in *Chlamydoselachus* it is much more pronounced and has not the space separating the two articulations found in *Heptanchus*. Garman mentions a palatal or trabecular process which occurs at a point an inch and three quarters behind the front end of the palatoquadrate, and is received in a concave articular depression of the skull in the orbit. He says that it is attached at its upper end by ligament to the skull near the top of the orbital cavity. I have found the process in question in both skulls that I have examined. It is perhaps better to call it an ethmo-palatine process, this being in accord with modern nomenclature. I cannot, however, agree with Garman in what he says about its ligamentous attachment to the skull. It is not attached by any definite band-like ligament such as that figured by him on Pl. viii. It is surmounted by a pad of capsular ligament which appears to be in the nature of a thickening of the general soft connective tissue surrounding the whole process. A similar capsular ligament has already been described as occurring between the obliquely placed head of the hyomandibular and the articular concavity on the side of the auditory capsule. Both are very different from the strong, fibrous, band like post-spiracular ligament which suspends the jaws from the skull.

I have found the hyal process which occurs on the upper ridge of the quadratic portion of the upper jaw, close to its posterior end, overhung by a similar one on the hyomandibular. The larger quadratic or otic process however, which, according to Garman, occurs farther forward at the widest part of the palatoquadrate, I have failed to discover.

The *ceratohyals* articulate by the anterior lobe of their lower extremities with the ventral surface of the basihyal, on either side of the median line. The latter cartilage is situated well forward between the mandibles and is raised up slightly into the oral cavity. As Garman has pointed out, it is elongate and tapers from the broader posterior end to the rounded anterior end. In the middle of the concave posterior border is a small, backwardly directed prominence, which Fürbringer (6) considers as the representative of the copula or basibranchial of the first branchial arch. The two lateral prominences, also at the posterior end, no doubt represent the hypobranchials of the first branchial arch as Garman suggested, and these together with the basibranchial have lost their distinct nature by becoming fused into the general mass of the basihyal.

On the ventral surface of the basihyal is found the somewhat oval excavation mentioned by Garman. In two cases out of three which I have examined, this communicates with the dorsal surface of the basihyal by means of a small round aperture at the anterior end of the concavity. In the third case, the excavation is not covered above by cartilage but was found to open directly into a slightly smaller concavity on the dorsal surface of the cartilage. The thyroid gland is situated in the hollow excavation on the ventral side, and in one example examined, a very interesting tubular structure, attached to the gland and communicating with the oral cavity, has been discovered. This is dealt with in a separate paper *.

A strong ensheathing fibrous ligament wraps the inner side of the quadrato-mandibular joint. It is continued on to the outer side of the joint and then proceeds backward to wrap the distal end of the hyomandibular and the proximal end of the ceratohyal, both of which are somewhat closely applied to the jaw joint (fig. 4). It is by this ligament that the hyostylic suspension of the jaws is is brought about. The ceratohyal is very closely applied in the greater part of its length to the inner side of the mandible where it fits into a sort of shallow groove. It is held firmly in its position by means of two important ligaments, in addition to the one just described which connects its proximal end with the angle of the jaws. Of these two ligaments one is external and the other internal in position. The former stretches between a process on the outer ridge of the ventro-posterior side of the mandible and a corresponding ridge on the outer edge of the ceratohyal. It is about half an inch in width, and may be termed the *ligamentum hyoideo-mandibulare externum*. The inner one is a broad, flat ligament (fig. 5) attached at its upper end to the convex inner surface of the proximal end of the palatoquadrate cartilage, and, stretching across the jaw joint and the mandible, is inserted along the ridge on the inner and upper side of the ceratohyal. It may be termed the *ligamentum quadrato-hyoideo internum*.

The disposition of the head muscles has been dealt with by Fürbringer (6), but the more important ridges and processes on the skull and jaws, which serve for the attachment of these muscles, are also worthy of some attention, seeing that they are quite pronouncedly developed. It will perhaps be easier in dealing with these to take the muscles separately and describe their relations to the particular ridges of attachment.

Levator maxillæ is attached above to the thin ridge (*s.c.s.*) (*t.* in Garman, Pl. viii. fig. A) which projects over the auditory capsule, and to the posterior edge of the postorbital process. It extends in front of the spiracle and is inserted on the inner and upper edge of the prominent ridge (*pq.r.*) along the dorsal side of the quadratic portion of the palatoquadrate. This insertion extends as far backward as the hyal process.

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* Goodey, T., "Vestiges of the Thyroid in *Chlamydoselachus anguineus*, *Scyllium catulus* and *S. canicula*." Anatomischer Anzeiger, Bd. xxxvi. 1910.

Adductor mandibulæ is a thick massive muscle, filling up the concavities on the outer sides of the palatoquadrate and the mandible. It is divided by an aponeurosis, which is in the line of the mouth angle, and is attached above to the lower edge of the palatoquadrate ridge previously mentioned. Below, it is similarly attached to a correspondingly sharp ridge (*m.r.*) on the ventro-lateral border of the mandible.

Constrictor superficialis is a thin, extensive muscle lying behind the hyomandibular. It extends round the jaw angle to the ventral surface of the head, where it lies between the mandibles. It is attached above to the posterior end of the supra-capsular ridge (*s.c.r.*) and also to the outer surface of the hyomandibular. On the lower side it is attached to the inner edge of the sharp ridge (*m.r.*) which extends along the ventro lateral border of the mandible.

d. *Branchial Arches* (Plate XLIII. fig. 6).

Basibranchials. - The basibranchial of the first branchial arch is, as previously mentioned, probably represented by the median prominence (*bbr.* 1) on the posterior border of the basihyal. The second one (*bbr.* 2) is situated considerably posterior to the first, level, in fact, with the bases of the third ceratobranchials. It is triangular in outline, attached anteriorly to the second pair of hypobranchials (*hbr.* 2) and is free behind. The third (*bbr.* 3) is also triangular in outline and is distinct. It is attached by ligament anteriorly to the third pair of hypobranchials and is firmly united behind by ligament to the fourth pair of hypobranchials.

The fourth basibranchial is indistinguishable from the corresponding hypobranchials. Garman describes it as lying between these. However, in the two cases that I have examined it is certainly not present, and I am inclined to believe that it has become fused with the large posterior basibranchial. The latter no doubt represents the fourth, fifth, and sixth basibranchials together with their corresponding hypobranchials all fused into one piece. It ends posteriorly in an elongate, tapering median process.

Hypobranchials. The pair corresponding to the first arch are represented by the lateral prominences (*hbr.* 1) on the posterior border of the basihyal. The second pair (*hbr.* 2) are flat and broad anteriorly, where they overlie the expanded part of the lower ends of the first ceratobranchials. They are somewhat thin there, and on the posterior edge are united by ligament to their corresponding ceratobranchials. Towards their posterior extremities they gradually taper and they are united to the second basibranchial. The third pair (*hbr.* 3) is essentially similar in shape to the second pair, the articulations being with the corresponding ceratobranchials and basibranchial. The fourth pair (*hbr.* 4) is more rounded than the second and third, and each hypobranchial has a bend in it so that the lateral part stands out at right angles to the axial portion. The cartilages forming this pair are fused in the median line, and are closely united by ligament with the large posterior basibranchial. In another example they are not fused with each other, but are closely and firmly attached together by ligament (fig. 6). The fifth pair is represented by rather prominent lateral processes (*hbr.* 5) which lie close to the anterior end of the large basibranchial. The sixth pair is also represented by lateral processes, not so pronounced, however, as the fifth pair.

Ceratobranchials.—I have little to add here to Garman's description, except to say that all—excluding the sixth—have a forward bend at their lower extremities, which brings these parts parallel with the median horizontal axis. The first and second pairs are curiously expanded also in this region, having an almost bilobate appearance. The posterior part of the expansion is rounded and underlies the expanded part of the following hypobranchials.

The sixth pair is very massive and on its anterior ventral border each has a thin, almost wing-like portion, which Fürbringer considers as the representative of the branchial rays of this arch. There is nothing of note in the epi- and pharyngo-branchials of the first five arches. In the case of the sixth, however, it is probable that only the epibranchial is present; the pharyngobranchial being perhaps incorporated with it. It has a peculiar shape, quite different from the slender, tapering bar figured by Garman. At its point of attachment to the distal end of the ceratobranchial it has an irregular outline. It next narrows somewhat, and then carries a small process on its inner concave border. The outer edge is convex and the whole piece gradually tapers to a rounded end, which is anteriorly and inwardly directed.

Seventh vestigial arch.—This is not present in the specimen which serves for the description of most of this paper, unless it be that it is represented by a pair of rather sharp ridges on the ventral side of the last basibranchial at the proximal ends of the sixth ceratobranchials. In the case, however, of the large female specimen it is present, and takes the form of a pair of small segmental, tapering pieces (*v.b.a.* 7) lying on the ventral side of the last basibranchial at the bases of the sixth ceratobranchials.

Each arch consists of two small pieces of cartilage united by connective tissue fibres to the surrounding parts. The more anterior portion in each is rather irregular in outline and on its posterior border carries a second slender, tapering portion. Fürbringer (6), who was the first to describe this very interesting vestige, merely speaks of it as a small piece of cartilage, and his figure gives no adequate idea of its structure and disposition relative to the surrounding parts.

As a matter of fact, it is very variable in structure; for that described by Hawkes (17) was made up of four small pieces on one side and two on the other, lying close to the ceratobranchial of the sixth arch on the posterior side near to the median extremity.

e. *Branchial Rays.*

These are thin, tapering rods of cartilage lying embedded in the interbranchial septa, a little closer to the inner surfaces of the latter than to the outer. Proximally they are applied to the posterior sides of the branchial arches, and distally they project somewhat beyond the margins of the interbranchial septa, to which they thus give a crenulate appearance.

One or two cases were observed in which two rays appeared to be fused proximally, apparently having a common origin. In another case two rays which had separate origins fused, and became produced so as to form one ray.

The greatest number of rays occurs on the hyoid arch, and as we proceed posteriorly the number gradually decreases for the six branchial arches, though subject to some variation. The sixth arch carries no distinct rod-like rays, but a thin laminate portion (*l.p.*) is found on the anterior ventral edge of the ceratobranchial. This, as previously mentioned, is regarded by Fürbringer as the representative of the branchial rays fused with the ceratobranchial. Whether this is the case or not, appears to me to be an open question. This lamina may be merely a thin extension of the ceratobranchial. Again, there seems to be no particular reason why the original branchial rays—if such were present—should have fused into a common lamina and have become firmly attached to the arch. As a rule, it appears, branchial rays are not met with on the last arch in Selachians, and why this portion should be looked upon as their representative in *Chlamydoselachus* it is somewhat difficult to understand. The first series of numbers in the following tables is from the complete male specimen; the second is from the large female. Both right and left sides are given.

Male.	R.	L.
Hyoid arch	28	26
First branchial arch	18	17
Second „ „	16	17
Third „ „	14	14
Fourth „ „	13	14
Fifth „ „	10	9

Female.	R.	L.
Hyoid arch	25	27
First branchial arch	19	19
Second „ „	14	16
Third „ „	15	14
Fourth „ „	14	12
Fifth „ „	9	10

f. *The Spiracle.*

The external opening of the left spiracle is an obliquely placed slit on the postero-dorso-lateral surface of the head, measuring about one centimetre in length. The right one is about one-half this length. On removing the skin and carefully dissecting away the underlying spongy cutis which covers the jaw-muscles, it is seen that the lumen of the spiracle passes down into the oral cavity between the hyomandibular and the mandibular cartilages. Just inside the external opening, the cavity becomes enlarged and a short cæcal diverticulum is given off anteriorly. This is overlaid by the *levator maxillæ* muscle whose disposition has already been described. The cæcum extends as far forward as the anterior knob of the proximal end of the hyomandibular, which projects from the articular depression on the auditory capsule. It is not attached to the hyomandibular, but is separated from it by the hyoidean branch of the seventh nerve, which passes just internal and ventral to it. In all probability it is homologous with the more extensive cæca mentioned by Ridewood (27), which have been described in other Selachians by Müller and Van Bemmelen. In *Scyllium*, for example, the cæcum extends inwards over the hyomandibular and becomes firmly attached to the wall of the auditory capsule, being in some way concerned with the function of hearing. A similar cæcum is found in *Heptanchus*, so that here we have another point in which *Chlamydoselachus* differs from this member of the Notidanidæ. The pseudobranch in each spiracle consists of about ten short ridges, which lie on the anterior outer wall just inside the external aperture. In the Notidanidæ the pseudobranchs are said to be better developed than in any of the Selachians, so that in this respect we find *Chlamydoselachus* presenting a small difference from *Hexanchus* and *Heptanchus*.

g. *Features of Specialization and Comparison with* Notidanidæ.

Perhaps the most important point in regard to the specialization of the skull of *Chlamydoselachus* is to be seen in the extreme length and mobility of the jaws. These are exceptionally long, extending from the anterior, almost terminal mouth to a point well behind the posterior limit of the cranium. This extension is remarkable; in fact, one quarter of the total length of the jaws is found in this region, and it is this feature, connected with the exceptional length of the hyomandibular, which gives the jaws their great mobility. Indeed, their disposition relative to the cranium is quite different from that found in any other Selachian whose skull I have been able to examine or to see a figure of. It resembles nothing among the Vertebrates so much, perhaps, as the general disposition of the jaws in certain of the Ophidia. In this respect also *Chlamydoselachus* presents a striking difference from the two genera of the Notidanidæ. In both *Hexanchus* and *Heptanchus* the mouth is ventral and is situated far back. The suspension of the jaws is amphistylic, and the palatoquadrate cartilages have a postorbital articulation with the cranium. Moreover, the extension of the jaws posterior to the cranium is but very slight.

IV. The Membranous Labyrinth. (Plate XLIII. figs. 7 & 8.)

The organ of the right side of the head has been worked out by dissecting away the surrounding cartilage, and forms the basis of the following account.

On removing the skin from the dorsal surface of the cranium it is seen that the parietal fossa is rather deep and possesses four apertures, two on either side of the median longitudinal line. One of these apertures, the anterior, is small, and transmits the ductus endolymphaticus. The posterior is larger and is closed with soft subcutaneous tissue. It is an opening into the perilymph cavity surrounding the posterior vertical canal, and seems to correspond to the tympanic aperture which Howes (**19**) described in *Raia*. Before proceeding further, I may mention that in this account I am following the nomenclature used by Stewart (**30**), which differs somewhat from that used by Retzius (**26**) in his great monograph.

The *ductus endolymphaticus*, on emerging from its cranial foramen, soon expands into the *saccus endolymphaticus*. The latter lies partly in the parietal fossa and is partly attached to the under surface of the skin covering this region. It is fairly regular in shape, somewhat rounded on its anterior surface, and extends posteriorly in a slightly outward direction, gradually becoming attenuated until it reaches its external aperture, which is quite small. Internally the ductus endolymphaticus leads into the *sacculus*. This is not rounded, but is laterally flattened, and gives off at its postero-inferior end the *lagena* in the form of a simple cæcum.

The *utriculus* in this species is like that in other Elasmobranchs, being divided into two portions, anterior and posterior, which do not communicate directly with each other, but indirectly through the sacculus.

The *anterior utricle* is rather laterally compressed and gives off the *anterior canal* dorsally. The latter curves forward and slightly outward, and describes almost a semicircle in its course, expanding at its lower end into the *anterior ampulla*, which then opens by a wide portion into the lower end of the utricle again.

The *recessus utriculi* is a somewhat spherical structure on the inferior and outer border of the anterior utricle. It communicates with the latter by means of a slit-like aperture just below that leading into the *ampulla externus*. The anterior utricle does not open directly into the sacculus, but communicates indirectly with it through the recessus utriculi, which opens into the sacculus by means of a rounded aperture on the postero-dorsal side of the recessus.

Arising from the dorsal end of the anterior utricle, and proceeding in a posterior and outward direction, is the *external canal*, which bends downward and comes to lie in an almost horizontal position. At its anterior end it is slightly elevated and expands into the *ampulla externus*, which communicates with the anterior utricle again by means of a short canal which rests on the upper side of the recessus utriculi, but does not open directly into it.

The *posterior utricle*, which is situated more internally than the rest of the labyrinth, is somewhat cylindrical in shape and is slightly curved upon itself. It communicates directly with the sacculus by means of a short, almost vertical canal, the *ductus utriculo saccularis posterior*. Arising from its dorsal end is the *posterior canal*, which curves outward and downward, and then expands into the *posterior ampulla*, which opens into the lower end of the utricle again.

All three canals, anterior and posterior vertical and external horizontal, are not rounded in section, but are markedly flattened, so that their height is equal to about twice their width. The external canal in its almost horizontal position lies with its compressed sides in the horizontal plane.

Nerve-Supply.

The sensory areas of the membranous labyrinth are supplied by branches of the eighth cranial nerve.

After passing from the brain through its foramen, the nerve breaks up into a number of ramuli which supply their particular regions.

The *ramulus ampulla anterior* is a rather fine branch which extends from the main nerve-trunk to the anterior ampulla, lying chiefly on the outer side of the lower portion of the anterior utricle.

Arising next from the main trunk are two ramuli, which appear to have a common origin. These are the *ramulus recessus utriculi* and the *ramulus ampulla externus*. Both curve under the recessus utriculi and come to lie on its outer surface, the ramulus ampulla externus proceeding upward on to the external ampulla, where it supplies the two rounded cristæ. The main portion of the nerve now goes on to form the ramuli sacculi. It first gives rise to a flattened branch which extends upward and follows the inner anterior border of the sacculus, thus forming one *ramulus sacculus*. The rest of the nerve proceeds in an almost horizontal direction and lies on the inner surface of the sacculus, forming the main *ramulus sacculus*. This gives off fine branches on its lower side which supply the maculæ of the sacculus. Arising from its posterior end are three fine branches: a lower one, the *ramulus lagena*, supplying the maculæ of the lagena; a median one, the *ramulus ampulla posterior*, lying chiefly on the inner surface of the posterior utricle and supplying the posterior ampulla; and an upper one, the *ramulus neglectus*, which curves upward toward the ductus utriculo saccularis posterior.

In structure and in the distribution of the nerve-supply the membranous labyrinth of *Chlamydoselachus* resembles rather closely that of *Notidanus* (*Hexanchus*) *griseus* figured by Stewart (**30**).

V. VERTEBRAL COLUMN. (Plates XLIII.-XLV. figs. 9-17.)

The notochord is persistent, and reaches from the pituitary fossa in the basis cranii to the extreme tip of the long tapering tail. There is an elastic supradorsal longitudinal ligament which extends from the back of the cranium to a point just posterior to the dorsal fin, where the dorsal supports of the caudal fin commence. The number of vertebræ, as determined by neuromeres, is one hundred and twelve, and this number includes the irregular region at the extreme tip of the tail -to be dealt with in detail later. In determining this number, I have counted the ventral root foramina of the spinal nerves carried by the basidorsals, as these are larger than the dorsal root foramina. Moreover, the first foramen at the anterior end of the column is a ventral one. The vertebral elements present, named according to Gadow's (**9**) nomenclature, are as follows:—

Dorsalia: basidorsals, interdorsals, and suprabasidorsals, the last-mentioned being segmented off from the apices of the basidorsals. The dorsal radial supports of the caudal fin I do not consider as dorso-spinalia, because at their commencement anteriorly they are not always continuous with the neural arches, and, moreover, there is as much evidence to show that in general they originate independently of the vertebral column as there is in favour of their being portions segmented off from the dorsalia below them.

Ventralia: basiventrals, interventrals, ribs, and hæmal arches, and hæmal spines in the caudal region.

I have been unable to find the calcifications which Garman mentions as occurring in the mouths of the foramina for the spinal nerves. No trace of them can be detected even after carefully cleaning away the connective tissue which closely invests the vertebral column. In fact, it would be somewhat surprising if such calcifications were present, considering the small amount of calcareous secretion found in the skeleton at all.

It is perhaps worthy of note that, in the largest specimen examined, the vertebral column over the abdomen was not straight, but was contorted so as to have an undulating outline in the horizontal plane. Whether this was due to abnormal growth or to the action of the preservative I do not know, but I am inclined to the latter view.

In connection with the formation of centra, my investigations have revealed a number of points which Garman did not observe, and for this reason my account will be somewhat full. For purposes of description I have divided the column into four regions, 1, 2, 3, and 4, which are quite arbitrary, and, though not corresponding exactly with any recognized divisions of the body, yet may roughly be described as cephalic, trunk, main caudal and terminal caudal regions. My reason for doing so is, that to treat of the whole length of the column in a continuous description would mean a needless repetition of words, thus tending to make the meaning obscure. The regions are as follows:—1. Anterior cephalic portion extending for about twelve centimetres behind the skull. 2. The region extending from the posterior end of 1, over the abdomen and reaching to the level of the cloaca; what may conveniently be termed the "trunk region." 3. The main caudal region extending from the posterior end of 2 to a point about eleven centimetres from the tip of the tail. 4. The last eleven centimetres of the tail, terminal caudal region.

h. *Description of Regions* 1, 2, 3, *and* 4.

The vertebral column is fused to the cranium quite firmly, so that but slight articulation is possible between the two. In this particular region of the column, viz. 1, there are regular vertebral constrictions of the notochord in the form of ring-like thickenings of the chordal sheath (fig. 9). This figure represents a view of a median, vertical, longitudinal section. It can be easily made out from this that each constriction occurs beneath a basidorsal, and also that the majority of the constrictions are well calcified. This particular point is of considerable interest, and is here fully dealt with. The first five constrictions—counting from the left—are calcified regularly, so that each centrum is typically cyclospondylic, being in the form of a short cylinder pinched in round the middle. The calcified areas thus present the appearance of two V's placed point to point. The sixth centrum has a calcified V above, but below, the calcification is irregular, being represented by only a small patch of calcareous secretion. The seventh is regular above, but below, the V is calcified all over. Eight, nine, and ten are also regular above and below, except that the lower V is larger in each case than the upper one, the latter in the tenth being very small. Constrictions are visible beneath basidorsals eleven, twelve, and thirteen, but no calcified areas are apparent in these cases, although, externally, the notochord shows definite calcified bands in the case of eleven and twelve. With these two, then, it is evident that calcification has not proceeded as far inward as in the more anterior ones. It also reveals the fact that the process of the deposition of calcareous salts begins on the outside of each constriction, and gradually proceeds towards the interior. Constrictions eleven and twelve may be looked upon, therefore, as being in a state of semi-calcification, whilst thirteen is merely a constriction of the chordal sheath, in which calcification has not commenced. The intervertebral spaces are filled with soft notochordal tissue, and there are no secondary calcifications in these areas.

For comparative purposes I have thought it worth while to give a drawing (fig. 10) of a corresponding anterior region from another and larger specimen. In this there are seen eleven definitely calcified cyclospondylic centra, which gradually increase in width as we proceed from left to right. Each one is in the form of two V's placed point to point, and, moreover, corresponds exactly in position with a calcified band on the exterior of the notochord. It is worthy of note also that the soft notochordal tissue gradually becomes obliterated from the intervertebral spaces as we approach the skull, so that in the space between the first centrum and the cranium soft tissue is not present at all. The larger, more definite, and regular calcifications of the centra in the larger specimen are of considerable interest because they seem to indicate—as will be shown in another region of the vertebral column—that the extent to which calcification takes place depends upon the age of the specimen, for apparently the size depends upon the age. The older the specimen the more definitely and regularly calcified are the regions where calcification may occur. Garman mentions this region, and says that there are vertebral constrictions which are somewhat calcified, but he does not state how far this condition obtains, and his figure of a longitudinal vertical section taken in this region is very indefinite. The calcified areas are represented as being of irregular shape, much more rounded than those which I have found. They are also continuous with one another, whereas those which I have found are quite discontinuous.

Region 2.—The "trunk region" is the longest of all, and shows the least differentiation of the notochord. The dorsalia are represented by basidorsals and interdorsals, triangular in outline, suprabasidorsals segmented off from the apices of the basidorsals as small wedge-shaped pieces. The ventralia are represented by basiventrals, somewhat rectangular in outline, and rounded interventrals. The latter are comparatively small, and gradually decrease in size as we proceed posteriorly. The notochord is of uniform diameter, and shows slight but unmistakable signs of segmentation; each segment corresponding exactly with a basidorsal above and a basiventral below. The segmentation is shown by a difference in the appearance of the chordal sheath along lines corresponding in position to the ends of the basidorsals. At these points there appear to be narrow rings or annulations of the notochord as shown in fig. 11. In a view of the cut surface of a vertical longitudinal section of a portion from this region, no apparent constrictions of the notochord are found to correspond with the external segmentation of the chordal sheath. The interior of the chord presents a fairly uniform appearance, as was noted by Garman. If, however, a horizontal longitudinal section be made of the notochord, a regular sequence of constrictions of the chordal sheath is at once apparent. Each of these occurs beneath a basidorsal, and extends between two consecutive segmentation marks on the exterior of the chordal sheath. Each takes the form of a bulging inward of the sheath, so that a slightly pinched-in cylinder is formed.

The regions described thus far are typically monospondylic, *i.e.* each neuromere is made up of one of each of the vertebral elements, one basidorsal, one interdorsal, one suprabasidorsal, one basiventral, and one interventral The foramina for the spinal nerves do not occur between the dorsalia, but are actual perforations of the basidorsals and interdorsals. In the monospondylic regions each basidorsal transmits a foramen for a ventral root and each interdorsal one for a dorsal root. The ventral root foramina are larger than the dorsal ones.

Ribs These are small, thin, cartilaginous pieces segmented off from the basiventrals, with which they are continuous. They occur in regions 1 and 2, and extend from the eighth to the sixty-fourth neuromeres inclusive. At their posterior end they reach a point on the vertebral column a short distance anterior to the level of the cloaca, where they terminate abruptly, having apparently diminished but very little in size. More posterior to this point the basiventrals begin to grow downward, and gradually assume the form of wedge-shaped pieces which afterwards fuse beneath the hæmal canal and thus give rise to the hæmal spines.

Region 3.—At the seventieth neuromere we get the transition from the monospondylic to the diplospondylic condition taking place (see fig. 12). As represented in the figure, the latter condition appears to be brought about by the segmenting off of a small basidorsal from the anterior side of a typical monospondylous one. By this means each single large basidorsal gives rise to two smaller ones, and between these there is inserted a small interdorsal. The small basidorsals have narrow suprabasidorsals segmented off from their apices as thin wedge-shaped pieces. A ventral root foramen perforates the posterior one of each pair of diplospondylous basidorsals, whilst the succeeding interdorsal transmits a dorsal root foramen. In this way we have the typical diplospondylic condition of vertebræ brought about, and this arrangement obtains to a point about eleven centimetres from the tip of the tail. At the seventy-second neuromere, as shown in fig. 12, we find the monospondylic condition again occurring, apparently as a reversion to the more primitive stage in development. Instead of finding two of each of the arcualia we only have a single large basidorsal with a ventral root foramen near its posterior edge, followed by a single large interdorsal. However, on the lower side of the notochord there are two basiventrals and interventrals, thus indicating that although the dorsalia have not been segmented into the double condition, yet this has occurred in the ventralia. This single neuromere is of interest, because it seems to indicate that the diplospondylic condition is the secondary one, arising by segmentation of the parts which go to form the more primitive monospondylic condition.

It can be seen from fig. 13 that in this diplospondylic region we have an alternation of imperforate and perforate basidorsals, between which occur the perforate and imperforate interdorsals. On the ventral side of the notochord we have a similar segmentation of the ventralia. The notochord in this region has a segmented appearance, which is brought about by the occurrence of bands of cartilage round it. These bands are in reality extensions of the dorsal and ventral arcualia—basidorsals and basiventrals—round the chordal sheath, and they alternate regularly with spaces in which the sheath is naked. They are found in the trunk region as well, only there each cartilaginous band is very thin, and is only recognizable in microscopic sections.

In the main caudal region, however, the bands are much more pronounced in growth. Here also there is a marked difference in the relative size of the two kinds of basidorsals. The imperforate ones are larger than the perforate, and this difference in size obtains especially where the caudal fin is deepest. As we proceed towards the tip of the tail the dorsalia gradually become more nearly equal in size until at a point just anterior to where they lose their identity, they are quite equal.

Perhaps the most interesting feature, however, of the skeleton in this particular region is that which is found from a point level with the posterior end of the anal fin to within a short distance of the tip of the tail. Here we find definite calcified rings round the chordal sheath which correspond in position to the basidorsals above and lie internal to the cartilaginous bands just mentioned. They are shown in fig. 13, where they appear as unshaded bands on the notochord extending between a large imperforate basidorsal above and the corresponding basiventral below. There is also an indication in the figure of a band beneath a perforate basidorsal and this, as it stands, may be somewhat misleading, appearing as if it were somewhat exceptional. This, however, is not the case, as only a short distance posterior to the portion figured the calcified rings become as well marked beneath the perforate basidorsals as beneath the imperforate ones. Fig. 14 represents a longitudinal vertical section of fig. 13. It is at once apparent from this that internal to each broad calcified band, *i. e.* beneath each imperforate basidorsal, we have a constriction of the chordal sheath in the form of an incipient centrum, the calcification extending into it and lending it additional strength. Beneath each perforate basidorsal also there is a very slight constriction of the chordal sheath without any trace of calcification.

The points just dealt with are shown much more clearly in a portion of the vertebral column taken from the larger, and probably older, female specimen. In this the extensions of the arcualia are very pronouncedly developed in the main caudal region, those beneath the perforate basidorsals being quite well shown. Both the latter and the larger ones beneath imperforate basidorsals are ridged in surface view as shown in fig. 15 In a view of a longitudinal vertical section of this portion (fig. 16), it is at once evident that in this specimen the formation of centra has proceeded much farther than in the smaller and, doubtless, younger specimen. The constrictions beneath the imperforate basidorsals extend well towards the centre of the notochord, whilst those beneath the perforate basidorsals are quite well developed, being much larger and more sharply defined than the corresponding constrictions in the smaller specimen. In both large and small constrictions also calcification has taken place, so that rounded V's are shown in the sectional view.

In the caudal region, then, we have well-marked, incipient, cyclospondylic centra. Another point which is especially interesting is that the calcified rings become most strongly developed in that part of the notochord below which the ventral lobe of the caudal fin has its greatest depth. One would expect this to be the case when the occurrence of centra and calcified bands is considered from the point of view of the mechanical importance of this region. If the diplospondylic condition of the vertebral column is concerned, as Ridewood (28) suggests, with flexibility, then we have here double the number of parts capable of articulation with one another that we should have if the monospondylic condition obtained in its place. Since also, the greatest purchase on the water is obtained by the tail where the caudal fin is deepest, we should expect to find here not only flexibility provided for but also a provision for increased strength in the skeletal supporting tissue. This is indeed what we actually find, for, as pointed out above, the diplospondylic condition is found here and the incipient centra are most strongly developed and calcified over the deepest part of the caudal fin.

Region 4.—This short region is of particular interest, because it has not been figured and described before. The specimen which Garman figured had lost the extreme tip of the tail. Fig. 17 represents it natural size, and from this it is seen that the vertebral column is a gradually tapering structure which remains segmented up to the end, no urostyle being present. The notochord has but very slight growths of the arcualia round it, and in two parts it is slightly segmented externally. In the dorsalia at the commencement of the region can be recognized both basidorsals and interdorsals. Very soon, however, the distinction between them becomes lost and they apparently fuse with each other to form small, irregularly shaped pieces, which, towards the extreme tip, are rhomboidal in outline and are of varying lengths. The dorsal radial elements, which are borne on the dorsal side of the neural arches, are also of variable length. They do not correspond segmentally with the dorsalia, and as we approach the extreme tip of the tail they become comparatively long. The hæmal spines are the ~~most~~ regular in shape and occurrence, being, with one or two exceptions, of the same width up to the end of the tail.

The point of special interest in this region is the disposition of the nerve foramina, which perforate the dorsalia. Anterior to the portion figured, the caudal region is typically diplospondylic, as already described. The ventral foramina are, throughout the vertebral column, larger than the dorsal ones. At the commencement of the figure, on the left-hand side can be seen a basidorsal which carries a nerve foramen. The succeeding interdorsal is imperforate, the dorsal and ventral roots of the spinal nerve having apparently united or approximated very closely together so that one foramen will transmit both. This condition also holds for the succeeding spinal nerves. In counting the number of dorsal elements separating the foramina depicted in fig. 15, it is seen that between the first foramen and the following one there are two dorsal elements. Between the second and third there are also two; between third and fourth, three; between fourth and fifth, nine; between fifth and sixth, eleven; and between this and the end of the tail there are thirty elements without a single perforation. This arrangement of the foramina in relation to the number of dorsalia is obviously quite irregular, and so far from being in accord with Ridewood's (**28**) and Mayer's (**22**) contention that the terminal region of the vertebral column is monospondylic, it shows that in *Chlamydoselachus*, at any rate, the neural apertures are so irregular in arrangement that this particular region may quite well be termed '*heterospondylic*.' The musculature of the region in question is very much reduced, and we should scarcely expect to find so perfect a nerve-supply as is found more anteriorly. Moreover, with the irregularity in the shape and size of the arcualia and their non-segmental arrangement relatively to one another, it is difficult to imagine how a monospondylic condition could obtain here.

It seemed desirable to ascertain in what relation the myomeres of the tail stand to the neuromeres. In order to do this the skin was taken off from the other side of the tail and posterior portion of the trunk, so as to reveal the myomeres with their separating myocommata. On examining the limits of the myomeres it was seen that each one in the trunk corresponds in extent with a monospondylic neuromere. In the main caudal region each myomere is equal in extent with a diplospondylic neuromere. A determination was next made of the number of myomeres from the beginning of the diplospondylic region to the point where the distinction between the separate myocommata is lost, *i. e.* within five centimetres of the extreme tip of the tail. This number is forty-two. The number of neuromeres was next determined for the same region, and this also is forty-two. Thus the number of myomeres and neuromeres is the same in the tail, and each irregular or heterospondylic neuromere of region "4" has its corresponding myomere.

The number of neuromeres for the side of the tail on which the myomeres were counted was next determined. After carefully removing the muscular tissue, the spinal nerves were left, and by examining these through a dissecting microscope their number and distribution could be determined. The relation of their foramina to the dorsalia presents a considerable difference from the condition found on the other side of the tail. The total number of neuromeres for the region in question is the same for both sides, viz. forty-two; but instead of the irregularly-disposed foramina being separated by dorsal elements arranged in the order of the numbers, 2, 2, 3, 9, and 11, we find the following numbers of dorsalia separating them, 1, 2, 2, 2, and 14. From this it can be seen that the regular diplospondylic condition has proceeded one neuromere more posterior on this side than on the other, and that the following three are also more regular than the corresponding three of the other side. But there is no indication of a return to the monospondylic condition. This very interesting condition of heterospondyly is one which, so far as I have been able to ascertain, has not been described for any other Selachian fish.

i. *Summary of special features and comparison with* Notidanidæ.

In summarizing the leading characteristics of the vertebral column of *Chlamydoselachus*, the following points may be mentioned:—First, the variety which it exhibits in the formation of centra. At the extreme anterior end the constrictions form cyclospondylic well-calcified centra. These may be followed by smaller constrictions in a semi-calcified condition. In the trunk-region are found the slightly constricted cylinders of the notochord, representing the lowest of all the stages in centra-formation. The main caudal region is characterized by the occurrence in it of constrictions of two sizes, the larger more calcified ones lying beneath the imperforate basidorsals, and the smaller less calcified ones lying beneath the perforate basidorsals. This difference in size gradually becomes lost as we proceed towards the tip of the tail, the constrictions becoming equal in size concurrently with the equalization in the size of the imperforate and perforate basidorsals. This particular point of the occurrence of centra in the tail-region is deserving of special emphasis, inasmuch as three recent text-books of zoology give the uniform character of the notochord and absence of centra in this region as a diagnostic feature of the Chlamydoselachidæ. The very pronounced growth of the basidorsals and basiventrals around the chordal sheath in the main caudal region is also very noteworthy. The great length of the diplospondylic region is of considerable interest, extending as it does through thirty-eight neuromeres, viz., from seventy to one-hundred and eight. The *heterospondylic* portion of the tip of the tail is, so far as I am aware, unique in Selachians.

The points at which the calcified centra occur is perhaps deserving of some mention. It seems that they are found where there are the greatest demands made for strength. At the anterior end, combined with the fusion of the vertebral column to the cranium, they give a rigidity to the supporting elements which is of service no doubt in enabling the fish to cleave the water. In the caudal region they meet the demand for increased strength caused by the purchase which the caudal fin obtains upon the water.

Compared with *Hexanchus* the vertebral column of *Chlamydoselachus* must be regarded, I think, as showing more specialized characters. In the former the notochord is simply constricted by annular thickenings of the cartilaginous sheath, no calcifications being present. The vertebral column of *Heptanchus*, however, is on the whole more specialized than that of *Chlamydoselachus*. for although the double-cone arrangement is not so pronounced at the anterior end as in *Chlamydoselachus*, yet the notochord is constricted vertebrally by a series of calcified rings which assume more and more the form of double cones towards the tail. And, moreover, in the caudal region secondary calcifications may give rise to a number of short rays radiating out from the centre of the double cones.

VI. Pectoral Girdle and Fins. (Plate XLV. fig. 18.)

Pectoral girdle.—I have nothing to add to the account of the girdle given by Garman (**10**. pp. 13, 14), except to say that my observations, made on three girdles, agree with his description and figure, neglecting of course a few trifling details due no doubt to individual variations.

Pectoral fins.—In regard to the pectoral fins there are certain rather important differences between the account and figure given by Garman and the observations which I have made on three pairs of fins. The articulation of the fin with the coracoid is unibasal, and the articular surface of the mesopterygium is about twice as large as that of the propterygium.

The *propterygium* is small, triangular in outline, and has a hollow articular surface. It carries no radials.

The *mesopterygium* is moderately large, is irregular in shape, resembling somewhat a truncated triangle, not being nearly so triangular as that figured by Garman. It carries radials on its posterior edge which show various degrees of fusion.

The *metapterygium* is an elongate, laterally compressed cartilage, carrying a large number of radials. It has a rounded dorsal ridge and gradually curves outward, not being practically straight as represented by Garman. Usually it is bisegmental, but in this respect it presents some interesting variations, for in two fins which I have examined it is trisegmental. In the former condition the proximal segment is the longer one and is more laterally compressed than the distal segment. The trisegmental condition is represented in two ways; first by the addition of a small proximal segment articulating with the coracoid, similar to that figured by Braus (**3**), and second, by the intercalation of a short segment between the normal proximal and distal segments.

As a rule the metapterygium is attached by ligament to the coracoid, but I have found one case in which the mesopterygium interposes a short process between the metapterygium and the coracoid and so prevents this attachment.

The *radials* are for the most part trisegmental, but the last two or three attached to the distal segment of the metapterygium are, as a rule, without segmentation. In the smaller fins which have been examined, two small post-axial radials are present; these are attached to the postero-lateral edge of the mesopterygium and are not, as Garman figured them, in the same straight line as the metapterygium. In the larger fins from the female specimen, however, the two most distal radials of the metapterygium are attached terminally and not post-axially to it. The proximal segments of the radials attached to the mesopterygium exhibit fusion, and in most cases the resultant mass of cartilage includes the first one or two of the proximal segments of the radials attached to the metapterygium, as shown in fig. 18.

In some cases the whole of the proximal segments do not fuse as represented in the figure; one or two may remain distinct. Whatever amount of fusion is shown, however, the original radials are indicated by lines of calcification in the fused cartilage.

I have entirely failed to find the nerve foramen figured by Braus (3) perforating the fused proximal segments to the radials attached to the mesopterygium.

VII. The Pelvic Girdle and Fins of the Female.
(Plate XLV. fig. 19.)

The *pelvic girdle* takes the form of a flattened plate of cartilage, which is, as Garman pointed out, about twice as long as wide; it is also equal in length to the proximal segment of the basipterygium. On its anterior edge it has a median convex protuberance, whilst its posterior edge is practically straight, not being nearly so concave as Garman has figured it. Its lateral edge is almost straight, but has a few indentations, thus presenting a difference from the curved edge figured by Garman. A short distance from each side there is a row of foramina which transmit spinal nerves; the second from the anterior end is the largest of these in all cases. In regard to these lateral foramina it is interesting to note that there is a certain amount of variability in their number in different specimens of *Chlamydoselachus*. There is also a difference in the number of foramina for each side of the girdle in one and the same specimen, as shown in the accompanying table:—

Specimen.	No of foramina. R side.	 L. side.
Large female	8	7
Male, Museum specimen	10	9
Male described in this paper...	8	9

Braus (2) gives 6 foramina in his figure, Garman (10) gives 8 on each side in his, and Goodrich (13) gives 10 on each side in his figure.

The *basipterygium* is a stout cartilage, articulating by means of a comparatively small surface with the postero-lateral border of the pelvic girdle. It has a rounded dorsal edge, is somewhat laterally compressed, and is also outwardly curved. Garman (**10**) says that at its extremity it has a series of three radials. These would seem to correspond with the distal segmented portion of the basipterygium and the two attached radials which I have figured. That the proximal one of these parts is a portion of the basipterygium is obvious from the figure (19). It carries, moreover, the penultimate radial.

Garman's figures (Pls. xi. & xii.) are scarcely to be trusted, as the two which he gives of these cartilages are different from each other in many respects, and particularly in regard to the points in question. There is, it must be admitted, a certain amount of variability in these cartilages, for in the fin of the opposite side to the one figured the basipterygium is bisegmental distally and the attachment of the terminal radial is slightly different. Moreover, there are differences between the one figured here and those given by Goodrich (**13**) in his plate of figures illustrating *Chlamydoselachus*.

The *lateral radials* are attached to the ventro-lateral edge of the pelvic girdle and of the basipterygium. They are for the most part trisegmental, whilst those at the anterior end are somewhat irregular in outline and show signs of fusion in some of their parts. The proximal segments of those attached to the pelvic girdle are dorsally flattened and are directed outward, obliquely downward, and slightly posteriorly. The median and distal segments of these lie more in the horizontal plane and are more rounded than the proximal segments. The radials attached to the basipterygium are, on the whole, narrower than those attached to the girdle, and they gradually become more attenuated as we proceed posteriorly. The last one is bisegmental and the three before that are complete.

The extraordinary length of the flattened pelvic girdle, the correspondingly large number of attached lateral radials, and the large number of lateral nerve foramina afford strong evidence of the primitive nature of the pelvic girdle in *Chlamydoselachus*.

VIII. THE MIXIPTERYGIA (Copulatory Appendages or Claspers). (Plate XLVI. figs. 20–22.)

j. *Measurements.*

	ins.	cms.
Length of animal	**52**	**130**
,, girdle + appendage	**8·5**	**21·4**
,, appendage	**4·5**	**11·25**
,, free part of appendage	**1·9**	**4·8**
Maximum width of appendage	**0·6**	**1·4**
,, ,, across fins	**5**	**12·5**
Length of basipterygium B	**1·5**	**3·8**
,, axial cartilage *b*	**4·5**	**11·6**

k. *Externals.*

Compared with the pectoral fins of the same specimen the pelvic fins and mixipterygia are quite large. As mentioned by Günther (**14**) and as will be seen from the measurements given above, the edges of the pelvic fins reach to within a comparatively short distance of the posterior ends of the appendages. On the dorsal side of each appendage, bounded by muscles, is the channel, which, toward its posterior end, becomes somewhat lateral in position and is bounded here by the knife-edged, movable terminal cartilages *T.d.* and *T.v.* In a ventral aspect the most prominent feature of the appendage is the glandular sac and compressor muscle, covered with loosely fitting soft skin. The sac does not extend anteriorly as far as the point of attachment of the basipterygium to the pelvic girdle. It may perhaps extend farther forward in more mature and larger specimens, or again it may be that the specimen under consideration was not taken at the period of sexual maturity, at which time the glandular sac enlarges considerably in most Elasmobranchs. The skin covering the sac and the terminal parts of the appendages is very soft and is entirely free from dermal spines.

l. *Musculature.*

In the following description I am adopting the nomenclature used by Huber (**20**), which differs somewhat from that used by Jungersen (**21**); more particularly in regard to the *musc. extensor* of the latter. This muscle Huber divided into *musc. flexor externus* and *musc. flexor internus*, both of which he found in all the examples on which he worked. I have found both also in *Chlamydoselachus.*

Musc. adductor, *A.*—This is comparatively small, and has its origin in the posterior border of the pelvic girdle, to which it is attached by a strong ligament. It is partially overlaid by the musc. flexor internus, and is inserted on the inner distal end of the basipterygium.

Musc. flexor externus, *Fl.e.*—This originates chiefly with *A*, and on the inner surface of the latter, from which it later on separates. It is inserted on the proximal end of the musc. dilatator and also on the whole of the proximal side of the radial *β*.

Musc. flexor internus, *Fl.i.*—This has its origin on the inner side of the basipterygium and is inserted on the proximal end of the axial cartilage *b*. It is partially overlaid by the musc. flexor externus.

Musc. dilatator, *D.*—This is a large muscle wrapping the inner and ventral surfaces of the axial cartilage *b*. It has its origin on the proximal end of *b*, partly beneath the radial *β*, and is inserted chiefly on the inner side of the same cartilage and on the terminal cartilage *T.d.* It is also inserted to a much smaller extent on the terminal cartilage *T.v.* In the greater part of its extent it forms the inner lip bounding the channel.

Musc. compressor, *S.*—On the dorsal side this muscle appears to arise from the outer side of *β*. It really has its origin on the outer side of the proximal end of the axial cartilage *b*, lying beneath *β*. Contributing largely to it also on its outer side are muscle-bundles belonging to the last elongated lateral radials. These bundles belong to the system of dorsal radial muscles (*O*) which arise from the body-wall. The last elongated radial carries a portion of the musc. compressor on its inner side, thus forming the outer lip bounding the channel. On the ventral side the musc. compressor takes the form of a somewhat oval sac whose cavity communicates with the channel on the dorsal side of the appendage, and whose lining is of epithelium, continuous with that covering the appendage. Its tapering anterior end is attached to the aponeurosis below the last ventral radial muscle, whilst distally it is connected by loose soft tissue with the terminal cartilage *T.v.* From the disposition of the whole muscle and from its relation to the other muscles of the appendage, I regard it as derived from modified muscle-bundles of the last two or three radials. This view is in agreement with Huber's, according to which the musculature of the musc. compressor has originated from modified radial muscle-bundles of the last few radials.

Radial muscles.—On the dorsal side there are the muscle-bundles *O*, which have their origin in a lateral aponeurosis running along the lower ends of the myomeres of the body-wall. In removing these muscles it is found that they are indistinctly divided into two layers, a superficial one reaching as far as the horny fibres of the fin and a deeper layer which does not extend quite as far outward.

On the ventral side there are the radial muscles *Ra*, which originate on the pelvic girdle close to the median line and extend outward to the horny fibres. Toward the anterior end the separate bundles have fused together, thus corresponding with the fusion of the radials above them.

m. *Skeleton.*

The following account is based on the dissection and examination of the copulatory appendage of the right side, and on a careful comparison made with this and the appendages from another specimen in the museum here.

The only previous accounts of the mixipterygia of *Chlamydoselachus* are those given by Günther (**14**), quoted by Jungersen (**21**) and by Braus (**3**). The mixipterygium figured by Braus is very different from that given by Günther or that given in fig. 22 in the present paper. It appears to be in an undeveloped condition, for it is small and no terminal cartilages are shown.

I have found a few rather important differences between the specimens which I have examined and those previously described and figured; these points will be dealt with in due course.

The *pelvic girdle* resembles that of the female, being a flattened, elongated plate of cartilage. It has a convex anterior edge (another example had this edge slightly concave) and a concave posterior edge. There are a number of nerve-foramina perforating it at a short distance from each lateral border, the number of which has already been given.

The *basipterygium*, *B*, is attached postero-laterally to the girdle, and there is a small piece of cartilage inserted dorsally in the attaching ligament, having the appearance of a portion segmented from the basipterygium. The latter is a fairly stout cartilage, is laterally compressed so that it is about twice as deep as wide, and is concave on its inner, and convex on its outer surface. It also has a rather prominent rounded ridge on its dorsal side. Attached to the dorso-posterior end of the basipterygium is the simple rod-shaped radial β. This was not mentioned by Günther, but Jungersen surmised that it was present and suggested that it had been overlooked. Braus has figured it. It is of interest to find that it is present, as it brings *Chlamydoselachus* into line with most of the described forms of Elasmobranch mixipterygia in this respect.

The *axial cartilage*, *b*, is attached to the distal end of the basipterygium somewhat ventro-laterally and toward the inner side. Lying in the thick connecting ligament is a single insignificant intercalary cartilage, *b*. 1, which Braus also has figured. The proximal end of the axial cartilage is comparatively thin and laterally compressed. In this respect, and particularly in respect to the single intercalary cartilage, there is here an important point of difference from Günther's figure. As shown in the latter, the axial cartilage is proximally broad and spindle-shaped, also one large and two small intercalary cartilages are shown closely attached to it, the large one having the appearance of a portion segmented from the axial cartilage. In view of the fact that I have found three axial cartilages narrow and somewhat compressed, with a single insignificant intercalary cartilage in each case, I can only suggest that the large intercalary cartilage figured by Günther is really a fractured portion of the anterior end of the axial cartilage, for it certainly has this appearance. With regard to the two smaller ones, it seems to me that the anterior one in his figure is really the base of the missing radial β, whilst the intermediate one corresponds to the single intercalary cartilage.

It is of interest to note also that the mixipterygium figured by Günther is that of the right side, as is the one which is given in this paper; but, curiously enough, the lateral radials in his figure are placed to the left of the basipterygium, whereas they are actually on the right side, as I have figured them.

Proceeding towards its distal end, we find that the axial cartilage becomes thicker and more rounded, attaining its greatest diameter at a point almost equidistant from each end. A groove now appears on its dorsal surface to the right of the median line, and gradually deepens toward the distal end of the cartilage. This is the groove in the cartilage corresponding to the channel in the musculature.

In his account of the claspers, Günther says that the groove is on the ventral side of the axial cartilage, but how he arrived at this conclusion it is very difficult to imagine, especially as he figured it on the dorsal side. The groove is overhung in its deepest part by the forwardly curved, tongue-shaped marginal cartilage, *R.v.*, which is attached basally to the outer border of the stem cartilage, and at its distal end to the ventral terminal cartilage, *T.v.* The latter and the corresponding cartilage, *T.d.*, on the inner side of the appendage have sharp, chondrified cutting edges, and are movably attached to the lateral borders of the distal end of the axial cartilage. The ventral terminal, *T.v.*, is shorter than the dorsal terminal, *T.d.*, and its anterior end is more sharply pointed than that of the latter. The ridge corresponding in position to the dorsal marginal cartilage, *R.d.*, of many other selachians is practically indistinguishable, and is certainly not as well marked in the specimens which I have examined as the ridge figured by Gunther.

The *lateral radials* are mostly trisegmental and, in general, they resemble those of the female pelvic fin, especially those attached to the pelvic girdle. Of these, the proximal segments are attached to the ventro-lateral edge of the girdle, and are directed outward, obliquely downward, and in a slightly posterior direction. They are flattened on their dorsal surface and the three or four anterior ones exhibit fusion. Those attached to the basipterygium are more rounded and gradually increase in length as we approach the posterior end of the cartilage. The last two or three are not segmented, and this is a further point of resemblance to the condition prevailing in the female fin. There are differences in the examples that I have examined in the extent to which the anterior radials exhibit fusion, and also in the segmental or non-segmental character of the posterior ones. In regard to the latter point, it will be seen from a comparison of my figure with that given by Günther, that whereas the last three radials are not segmented in my figure, only the last is complete in his.

When the mixipterygium of *Chlamydoselachus* is compared with that of *Hexanchus griseus*, described and figured by Huber, one is at once struck by the high degree of development presented by the organ in *Chlamydoselachus.* Whereas in *Hexanchus* the axial cartilage is represented by a comparatively short cartilage, scarcely distinguishable from a lateral radial, and bearing no accessory cartilages; the homologous part in *Chlamydoselachus* is a long, stout cartilage, furnished distally with three movable accessory cartilages.

IX. MEDIAN FINS.

In regard to these I have not much to say. My observations lead me to confirm the account given by Garman. It must, however, be pointed out that in his figure (Pl. xiii.) the small distal segments of the trisegmental radials of the anal fin are absent.

Fürbringer (7) gives a good figure of the dorsal fin, and on account of this, and also because Garman's figures of both dorsal and anal fins are in the main features correct, I have not deemed it advisable to give a drawing of these structures.

X. SUMMARY.

The following are a few of the most important points dealt with in the paper:—

1. The Membranous Labyrinth is described and figured for the first time, and it has been found to be of the usual selachian type, resembling rather closely that of *Hexanchus griseus*.

2. In the formation of the centra the following points are especially worthy of note:—

(*a*) The presence, at the anterior end of the vertebral column, of well-developed, calcified cyclospondylic centra.

(*b*) Slight constrictions of the notochord in the trunk region, best seen in horizontal longitudinal section, not calcified. The lowest stage in the development of centra.

(*c*) In the main caudal region, calcified cyclospondylic centra of two sizes are present, corresponding with the doubling in the number of arcualia, which here, more than elsewhere in the vertebral column, grow round the notochord and greatly strengthen the centra.

3. The terminal caudal region is *heterospondylic*, and not *monospondylic* as in many other Selachians.

4. The musculature and skeleton of the *mixipterygia* are dealt with fully for the first time. In regard to the musculature I have to record the presence of both *musc. flexor internus* and *musc. flexor externus* of Huber. In the skeleton I have found the modified radial β, and only one small intercalary cartilage *b*.1, not three as recorded by Günther.

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XII. EXPLANATION OF THE PLATES.

Plate XLII.

Fig. 1. Side view of skull, jaws depressed showing ethmo-palatine process and its articular facet. Slightly less than half natural size.
2. Median vertical longitudinal section of cranium and anterior part of vertebral column. Slightly reduced.
3. Jaw-joint seen from inside, widely open. × ½.
4. Postero-lateral view of first and second visceral arches and their connecting ligaments. × ½.
5. Internal view of jaw-joint showing relation of quadrato-hyoid ligament. × ½.

Plate XLIII.

Fig. 6. Ventral view of branchial arches, showing vestigial seventh branchial arch. × ½.
7. Membranous labyrinth seen from the inside. × 2.
8. Membranous labyrinth seen from the outside. × 2.
9. Vertical longitudinal section of anterior end of vertebral column, showing calcified cyclospondylic centra. Slightly reduced.
10. Vert. longit. section of anterior end of vertebral column of large female specimen, showing cyclospondylic centra. Slightly reduced.

Plate XLIV.

Fig. 11. Portion of vertebral column from trunk region with ribs attached. Nat. size.
12. Transitional region from mono- to diplospondylic condition of vertebræ; the numbers n. 70, etc. denote neuromeres; note especially n. 72. Nat. size.
13. Portion of vertebral column from main caudal region, n. 89 to n. 91; note calcified bands. Nat. size.
14. Vert. longit. section of fig. 13; note the calcified incipient centra. Nat. size.
15. Portion of vertebral column from main caudal region of large female specimen, the ridged extensions of the arcualia round the notochord are well shown. Nat. size.
16. Vert. longit. section of fig. 15, calcified cyclospondylic centra of two sizes are well shown. Nat. size.

Plate XLV.

Fig. 17. Terminal caudal region, *heterospondylic region*. Nat. size.
18. Left pectoral fin; note fused proximal segments of radials attached to mesopterygium, also two postaxial radials. Nat. size.
19. Dorsal view of right half of pelvic girdle and fin of female. × ½.

Plate XLVI.

Fig. 20. Dorsal view of right half of pelvic girdle and mixipterygium, showing musculature. × ½.
21. Ventral view of fig. 20. × ½.
22. Dorsal view of skeleton of right mixipterygium; note modified radial β, and intercalary cartilage, b. 1. × ½.

REFERENCE LETTERS.

Skull.

a.f.,	anterior fontanelle.
bbr. 1–6,	basibranchials.
bh.,	basihyal.
br.r.,	branchial rays.
cbr.,	ceratobranchials.
ch.,	notochord.
crh.,	ceratohyal.
ebr.,	epibranchial.
e.p.p.,	ethmo-palatine process.
f.,	foramen.
hbr. 1–6,	hypobranchials.
hym.,	hyomandibular.
hy.p.,	hyal process.
i.c.f.,	internal carotid foramen.
i.o.s.,	interorbital sinus.
j.l.,	joint ligament.
l.h.m.e.,	ligamentum hyoideo mandibulare externum.
l.q.h.i.,	ligamentum quadrato-hyoideo internum.
m.,	mandible.
m.r.,	mandibular ridge.
n.c.,	nasal cartilages.
o.c.,	olfactory capsule.
o.s.,	optic stalk.
p.f.,	parietal fossa.
po.p.,	postorbital process.
pq.,	palatoquadrate.
pr.p.,	preorbital process.
p.s.l.,	post-spiracular ligament.
pt.f.,	pituitary fossa.
r.,	rostrum.
s.c.r.,	supra-capsular ridge.
s.o. 1–4,	spino-occipital foramina.
sp.r.,	supraorbital ridge.
th.c.,	thyroid concavity.
v.b.a.7.,	vestigial 7th branchial arch.
I–X.,	cranial nerve foramina.
VII.*h.*,	hyoidean foramen of VII.

Membranous Labyrinth.

a.a.,	ampulla anterior.
a.d.e.,	apertura ductus endolymphaticus externus.
a.e.,	ampulla externus.
a.p.,	ampulla posterior.
c.a.,	canalis anterior.
c.e.,	canalis externus.
c.p.,	canalis posterior.
d.e.,	ductus endolymphaticus.
d.u.s.p.,	ductus utriculo saccularis posterior.
l.,	lagena.
p.f.,	parietal fossa.
r.a.a.,	ramulus ampulla anterior.
r.a.e.,	ramulus ampulla externus.
r.a.p.,	ramulus ampulla posterior.
rec.,	recessus utriculi.
r.l.,	ramulus lagena.
r.n.,	ramulus neglectus.
r.s.,	ramulus sacculus.
r.u.,	ramulus utriculi.
s.,	sacculus.
s.e.,	saccus endolymphaticus.
t.,	tympanic aperture.
u.a.,	utriculus anterior.
u.p.,	utriculus posterior.
VIII.,	8th cranial nerve.

Vertebral Column.

a.ch.s.,	annulation of chordal sheath.
bd.,	basidorsals.
bv.,	basiventrals.
cal.,	calcifications.
c.c.,	cyclospondylic centra.
ch.s.,	chordal sheath.
d.f.,	dorsal root foramina.
h.c.,	hæmal canal.
h.s.,	hæmal spines.
id.,	interdorsals.
i.bd.,	imperforate basidorsals.
i.id.,	imperforate interdorsals.
iv.,	interventrals.
iv.s.,	intervertebral spaces.
l.c.c.,	larger cyclospondylic centra.
n.,	neuromeres.
ne.c.,	neural canal.
p.bd.,	perforate basidorsals.
p.id.,	perforate interdorsals.
rb.,	ribs.
s.bd.,	supra-basidorsals.
s.c.c.,	smaller cyclospondylic centra.
s.d.l.,	supra-dorsal ligament.
v.f.,	ventral root foramina.

Paired Fins.

A,	musc. adductor.
B,	basipterygium.
b.,	axial cartilage.
*b.*1,	intercalary cartilage.
β,	modified radial.
bt.d.,	distal segment of basipterygium.
bt.p.,	proximal segment of basipterygium.
c.n.,	collector nerve.
D,	musc. dilatator.
Fl.e.,	musc. flexor externus.
Fl.i.,	musc. flexor internus.
l.n.f.,	longitudinal nerve foramina.
l.r.,	last lateral radial.
mst.,	mesopterygium.
mt.,	metapterygium.
O,	dorsal radial muscles.
p.g.,	pelvic girdle.
pt.,	propterygium.
pt.r.,	postaxial radials.
r.,	lateral radials.
Ra.,	ventral radial muscles.
R.v.,	marginal ventral cartilage.
S,	musc. compressor.
T.d.,	terminal dorsal cartilage.
T.v.,	terminal ventral cartilage.

2. Additional Notes on the Birds of Hainan.*
By W. R. OGILVIE-GRANT, F.Z.S., M.B.O.U.†

[Received March 15, 1910.]

The Natural History Museum has recently received a small collection of birds from the Five- and Seven-Finger Ranges, Central Hainan, procured by Mr. Robert Douglas, I.M.C., Shanghai. It was forwarded in the first instance as a present to the Zoological Society of London, but thanks to the good offices of the Secretary was transferred to the Natural History Museum. It contains several species of great interest, and among these examples of a new species of Wood-Shrike (*Tephrodornis hainanus*), and a new species of Ant-Thrush (*Pitta douglasi*) as well as a Bulbul (*Pycnonotus sinensis*), not hitherto found in Hainan.

In my article on the Birds of Hainan published in 1900 ‡ 239 species were enumerated as inhabiting the island. Since that paper was published Mr. Walter Rothschild has received a large collection of birds from the island of Hainan made by Mr. Alan Owston's Japanese collectors and containing specimens of the beautiful Tree-Partridge (*Arboricola ardens*), hitherto known only from the type-specimen. Mr. Rothschild described the following species and subspecies (*cf.* Bull. B. O. C. xiv. pp. 7–9, 1903):—

Psittiparus gularis hainanus.
Serilophus lunulatus polionotus.
Stachyris guttata swinhoei.
Trochalopteron canorum owstoni.
Stachyridopsis ruficeps goodsoni.
Pomatorhinus tickelli hainanus.
Cissa katsumatæ.§

The first of these, the so-called *P. g. hainanus*, does not appear to be distinct from *Paradoxornis fokiensis* David, for, as will be seen below, the difference in size is not appreciable. The species, however, was not included in my former paper, so that the total number of species of birds now known to occur in Hainan amounts to 249.

The number given for each species is the same as that used in my paper on the Birds of Hainan; for the sake of brevity this is referred to as 'Ogilvie-Grant.'

5 *a*. CISSA KATSUMATÆ Rothsch.

Cissa katsumatæ Rothsch. Bull. B. O. C. xiv. p. 9 (1903).

a–c. ♂ ♀. Seven-Finger Mts. 11th–15th November.

In describing this species Mr. Rothschild has compared it with

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* [The complete account of the new species described in this communication appears here, but since the names and preliminary diagnoses were published in the 'Abstract,' No. 81, 1910, these species are distinguished by the names being underlined.—EDITOR.]

† Communicated by permission of the Trustees of the British Museum.

‡ *Cf.* Ogilvie-Grant, P. Z. S. 1900, pp. 457–504, pls. xxxiii. & xxxiv.

§ A full account of this collection has just appeared. *Cf.* Hartert, Nov. Zool. xvii. pp. 189–254, pls. v. & vi. (1910): he enumerates 231 species and subspecies as occurring in Hainan, and describes 14 as new.

C. chinensis, but it is much more closely allied to *C. jefferyi* Sharpe, from Borneo, and to *C. robinsoni* Ogilvie-Grant, from the Malay Peninsula.

6. DENDROCITTA SINENSIS (Lath.).

Ogilvie-Grant, p. 463.

a. ♂. Five-Finger Mts. 9th November.
b. ♀. Seven-Finger Mts. 15th November.

Hainan examples of this Magpie appear to be somewhat smaller than Chinese birds. In six specimens the wing measures less than 5 inches, but in a seventh (a male) it attains a length of 5·4 inches. Three specimens have the middle pair of tail-feathers black to the base, and three show traces of grey, while in the seventh the *basal half* of the feathers is grey, as in the Formosan species, *D. formosæ* Swinhoe. Chinese examples may generally be distinguished from Hainan birds by their purer white upper tail-coverts, but these characters seem too variable to warrant the separation of the Hainan birds from typical *D. sinensis*. In certain respects they are intermediate between the Chinese and Formosan forms, the latter being always characterized by their greyer upper tail-coverts and the grey basal half of the middle pair of tail-feathers. Dr. Hartert has separated this bird as a subspecies under the name *D. s. insulæ*.

8. ACRIDOTHERES CRISTATELLUS (Gmel.).

Ogilvie-Grant, p. 463.

a, b. ♂ ♀. Seven-Finger Mts. 16th November.

Examples of this Starling from Hainan appear on the whole to be somewhat smaller than those from China, and have perhaps rather less white on the basal half of the primary quills. In six Hainan examples the wing-measurement varies from 4·8 to 5 inches, while in a seventh specimen it measures 5·25 inches. Dr. Hartert regards this bird as distinct and has named it *A. c. brevipennis*.

10. SPODIOPSAR SERICEUS (Gmel.).

Ogilvie-Grant, p. 463.

a. ♀. Five-Finger Mts. 9th November.

11. TEMNURUS NIGER (Styan).

Ogilvie-Grant, p. 464.

a, b. ♂ ♀. Seven-Finger Mts. 11th & 13th November.

A fine adult pair of this rare species.

12. MAINATUS INTERMEDIUS (A. Hay).

Ogilvie-Grant, p. 464.

a, b. ♂ ♀. Seven-Finger Mts. 11th & 16th November.

13. CHAPTIA ÆNEA (Vieill.).

Ogilvie-Grant, p. 464.

a, b. ♂ ♀. Five-Finger Mts. 9th November.

14. BUCHANGA LEUCOGENYS Wald.
Ogilvie-Grant, p. 464.
a, *b*. ♂ ♀. Seven-Finger Mts. 14th & 16th November.

17. DISSEMURUS PARADISEUS (Linn.).
Ogilvie-Grant, p. 465.
Dissemurus paradiseus johni Hartert, Nov. Zool. ix. p. 580 (1902).
a. ♂. Seven-Finger Mts. 13th November.

19. ORIOLUS NIGELLICAUDUS (Swinh.).
Ogilvie-Grant, p. 465.
a, *b*. ♂ ♀ imm. Seven-Finger Mts. 13th & 14th November.

An immature male and female have the middle pair of tail-feathers and the outer webs of all the remaining pairs crimson washed with blackish. The only adult male which I have been able to examine is Swinhoe's type-specimen. It would be interesting to know whether the blackish wash on the tail-feathers of this example is a constant character. In other respects it does not differ from the adult male of *O. ardens* Swinh.

23. EMBERIZA FUCATA Pall.
Ogilvie-Grant, p. 466.
a. ♀. Seven-Finger Mts. 13th November.

24. EMBERIZA SPODOCEPHALA Pall.
Ogilvie-Grant, p. 466.
a. ♂. Seven-Finger Mts. 14th November.

25. EMBERIZA AUREOLA Pall.
Ogilvie-Grant, p. 466.
a. ♀. Seven-Finger Mts. 15th November.

28. MOTACILLA LEUCOPSIS Gould.
Ogilvie-Grant, p. 467.
a, *b*. ♂ ♀. Seven-Finger Mts. 15th & 17th November.

29. MOTACILLA MELANOPE Pall.
Ogilvie-Grant, p. 467.
a, *b*. ♂ ♀. Seven-Finger Mts. 15th November.

33. ANTHUS RICHARDI Vieill.
Ogilvie-Grant, p. 467.
a. ♀. Seven-Finger Mts. 14th November.

42. LANIUS SCHACH Linn.
Ogilvie-Grant, p. 469.
a. Adult. Seven-Finger Mts. 13th November.

44. LANIUS FUSCATUS Less.
Ogilvie-Grant, p. 470.
a. ♀. Seven-Finger Mts. 15th November.

46. TEPHRODORNIS HAINANUS Ogilvie-Grant.

Tephrodornis pelvica Ogilvie-Grant (*nec* Hodgs.), P. Z. S. 1900, p. 470.

Tephrodornis hainanus Ogilvie-Grant, Abstract P. Z. S. No. 81, p. 18 (March 22nd, 1910).

Adult male. Differs from Indian examples of *T. pelvica* Hodgs. in having the mantle and back much darker and of a reddish-brown colour.

Adult female. Darker and browner above than the female of *T. pelvica* Hodgs.

a–d. ♂ ♀. Seven-Finger Mts. 15th–18th November. (*Types of the species.*)

Hab. Hainan and China.

Specimens from Hainan appear to be slightly smaller than those from China.

The measurements are as follows:—

	Wing of male.	Wing of female.
China	4·8 ins.	4·7 ins.
Hainan	4·5	4·45

An immature male from Dibrughur, Assam, 14th August (*J. R. Cripps: Hume Coll.*) and an adult female from the Dafla Hills, 11th December (*Col. H. H. Godwin-Austen*), appear to be referable to the Chinese form *T. ricketti* and not to *T. pelvica.*

50. LUSCINIOLA FUSCATA Blyth.

Ogilvie-Grant, p. 471.

a. Adult. Seven-Finger Mts. 13th November.

52. CETTIA CANTURIENS Swinh.

Ogilvie-Grant, p. 471.

a-c. ♂ ♀. Seven-Finger Mts. 13th-16th November.

59. TURDUS CARDIS Temm.

Ogilvie-Grant, p. 472.

a. [♀]. Seven-Finger Mts. 15th November.

61. TURDUS MANDARINUS Bonap.

Ogilvie-Grant, p. 472.

a. ♂. Seven-Finger Mts. 13th November.

68. ERITHACUS SIBILANS Swinh.

Ogilvie-Grant, p. 474.

a. Adult. Seven-Finger Mts. 11th November.

70. COPSYCHUS SAULARIS (Linn.).

Ogilvie-Grant, p. 474.

a, b. ♂ ♀. Seven-Finger Mts. 12th & 13th November.

71. Cittocincla minor Swinh.
Ogilvie-Grant, p. 474.
a, *b*. ♂ et ♀ imm. Seven-Finger Mts. 11th November.

72. Henicurus sinensis Gould.
Ogilvie-Grant, p. 474.
a, *b*. ♂ ♀. Seven-Finger Mts. 14th November.

74. Garrulax semitorquata Ogilvie-Grant.
Ogilvie-Grant, p. 475.
a. ♂. Seven-Finger Mts. 15th November.

75. Garrulax schmackeri Hartl.
Ogilvie-Grant, p. 475.
a–d. ♂ ♀. Seven-Finger Mts. 12th–15th November.

77. Dryonastes monachus Swinh.
Ogilvie-Grant, p. 476.
a, *b*. ♂ ♀. Seven-Finger Mts. 12th & 14th November.

78 *a*. Pomatorhinus hainanus Rothsch.
Pomatorhinus tickelli hainanus Rothsch. Bull. B. O. C. xiv. p. 9 (1903).
a. ♂. Seven-Finger Mts. 11th November.

82. Pycnonotus hainanus (Swinh.).
Ogilvie-Grant, p. 477.
a, *b*. ♂ ♀. Seven-Finger Mts. 12th & 16th November.

82 *a*. Pycnonotus sinensis (Gmel.).
Pycnonotus sinensis Ogilvie-Grant, Ibis, 1907, p. 189.
a. ♂. Seven-Finger Mts. 11th November.

This species is new to the island of Hainan. The specimen has the hinder part of the crown and occiput white and is apparently referable to the Chinese and Formosan species. The amount of white on the hinder part of the head varies greatly in different individuals of *P. sinensis*, some Chinese examples approaching *P. hainanus*, which has the entire crown and occiput black.

84 *a*. Paradoxornis fokiensis (David).
Psittiparus gularis hainanus Rothschild, Bull. B. O. C. xiv. p. 7 (1903).
a–d. ♂ ♀. Seven-Finger Mts. 13th–16th November.

Hainan specimens of *P. fokiensis* are on the average very slightly smaller than Chinese examples, and have been separated under the name *Psittiparus gularis hainanus*. The comparative measurements of Chinese and Hainan birds are as follows:—

	Wing.
14 specimens from Fohkien, China...	3·5–3·7 (one 3·8) inches.
4 specimens from Hainan	3·3–3·5

In typical *P. gularis* from the Himalaya, the upperparts are much paler and yellower.

85. HYPSIPETES PERNIGER Swinh.

Ogilvie-Grant, p. 478.

a–d. ♂ ♀. Seven-Finger Mts. 12th–17th November.

86. CRINIGER PALLIDUS Swinh.

Ogilvie-Grant, p. 478.

a. ♀. Seven-Finger Mts. 17th November.

87. CHLOROPSIS LAZULINA (Swinh.).

Ogilvie-Grant, p. 478.

a, b. ♂ ♀. Seven-Finger Mts. 13th & 15th November.

88. CAMPOPHAGA SATURATA (Swinh.).

Ogilvie-Grant, p. 478.

a–c. ♂ ♀. Seven-Finger Mts. 11th–15th November.

89. GRAUCALUS MACII Lesson.

Ogilvie-Grant, p. 478.

a, b. ♂ ♀. Seven-Finger Mts. 12th November.

91. PERICROCOTUS FRATERCULUS Swinh.

Ogilvie-Grant, p. 479.

a–c. ♂ ♀ et ♂ imm. Seven-Finger Mts. 11th & 12th November.

102. SIPHIA HAINANA Ogilvie-Grant.

Ogilvie-Grant, p. 480.

a, b. ♀ et ♂ imm. Seven-Finger Mts. 13th November.

107 *a.* PITTA DOUGLASI Ogilvie-Grant.

Abstract P.Z.S. No. 81, pp. 18, 19 (March 22nd, 1910).

Adult male.—Most nearly allied to *P. soror* Wardlaw Ramsay, from Cochin China, which it resembles in having the crown and occiput dull bluish-green like the back; lower back and rump bluish: fore-part of the head, cheeks, ear-coverts and lower part of the throat dull pink, chin inclining to whitish; lores, feathers surrounding the eye and on either side of the occiput rust-red; chest very similar, but tinged with pink; breast and rest of the underparts buff; lower part of the abdomen whitish; upper wing-coverts and scapulars greenish-blue like the mantle; quills brown margined on the outer web especially towards the extremity with pale brownish-buff, the five outer primaries white at the base of the inner web; tail greenish-blue like the back.

Total length ca. 8·0 inches; wing 4·45; tail 2·05; tarsus 2·0.

Adult female.—Differs from the male in being less brightly coloured; the top of the head, occiput and nape being olive-brown suffused with pink, and the rest of the upperparts, including the wing-coverts and scapulars, mostly dull olive-green;

the chest buff (instead of rust-red) tinged with pink, and the rest of the underparts paler buff.

Total length ca. 7·6 inches; wing 4·4; tail 1·9; tarsus 1·8.

a, b. ♂ ♀. Seven-Finger Mts. 11th November. (*Types of the species.*)

A second specimen of *P. soror* Wardlaw Ramsay, which was collected by Dr. J. J. Vassal in the neighbourhood of Nhatrang, Annam, like the type, has the feathers of the fore-neck and upper chest black tipped with buff or buff with a black median spot. I am uncertain whether this is a specific character or merely indicative of youth. No trace of these markings is to be found in the types of *P. douglasi*.

110. DENDROCOPUS CABANISI (Gould).

Ogilvie-Grant, p. 482.

a, b. ♂ ♀. Seven-Finger Mts. 12th November.

112. IYNGIPICUS KALEENSIS Swinh.

Ogilvie-Grant, p. 483.

Iyngipicus scintilliceps swinhoei Hartert, Nov. Zool. xvii. p. 221 (1910).

a. ♀. Seven-Finger Mts. 13th November.

113. MICROPTERNUS HOLROYDI Swinh.

Ogilvie-Grant, p. 483.

a, b. ♂ ♀. Seven-Finger Mts. 11th & 12th November.

Hargitt (Cat. Birds B.M. xviii. pp. 393, 403) says that Hainan birds differ from *M. fokiensis* not only in being smaller but in having the middles of the feathers of the chin and throat unicolorous with the underparts. In this he is no doubt mistaken, for in the freshly moulted pair procured by Mr. Douglas the feathers of the chin and throat are black edged with sandy-rufous just as in *M. fokiensis*. The specimens obtained by Swinhoe in February are all in worn plumage and at first sight appear to have the chin and throat uniform, but a careful examination reveals the fact that this is not really the case.

115. PALÆORNIS FASCIATA (Müll.).

Ogilvie-Grant, p. 484.

a, b. ♂ ♀. Seven-Finger Mts. 12th November.

120. CENTROPUS SINENSIS (Steph.).

Ogilvie-Grant, p. 485.

a, b. ♂ et imm. Seven-Finger Mts. 14th & 15th November.

121. CENTROPUS BENGALENSIS (Gmel.).

Ogilvie-Grant, p. 485.

a ♂ imm. Seven-Finger Mts. 15th November.

122. Rhopodytes tristis (Less.).
Ogilvie-Grant, p. 485.
a, b. ♂ ♀. Five-Finger Mts. 9th November.
c. Adult. Seven-Finger Mts. 13th November.

Dr. Hartert has distinguished Hainan examples of this species as *R. t. hainanus* [*cf.* Nov. Zool. xvii. p. 218 (1910)] on account of their slightly smaller size.

123. Harpactes hainanus Ogilvie-Grant.
Ogilvie-Grant, p. 485.
a, b. ♂. Seven-Finger Mts. 14th November.

129. Nyctiornis athertoni (Jard. & Selby).
Ogilvie-Grant, p. 486.
a, b. ♂ ♀. Seven-Finger Mts. 12th & 18th November.

130. Upupa indica Reichenb.
Ogilvie-Grant, p. 487.
a, b. ♂ ♀. Seven-Finger Mts. 12th & 13th November.

138. Eurystomus calonyx Hodgs.
Ogilvie-Grant, p. 488.
a. ♂ imm. Five-Finger Mts. 9th November.

141. Glaucidium whitelyi (Blyth).
Ogilvie-Grant, p. 488.
Glaucidium cuculoides persimile Hartert, Nov. Zool. xvii. p. 205 (1910).
a. ♀. Seven-Finger Mts. 14th November.

178. Arenaria interpres (Linn.).
Ogilvie-Grant, p. 494.
a. ♂. Seven-Finger Mts. 13th November.

222. Treron nipalensis (Hodgs.).
Ogilvie-Grant, p. 501.
a, b. ♂ ♀. Seven-Finger Mts. 12th November.

227. Macropygia minor Swinh.
Ogilvie-Grant, p. 502.
a. ♂. Seven-Finger Mts. 11th November.

230. Turtur chinensis (Scop.).
Ogilvie-Grant, p. 502.
Turtur chinensis hainanus Hartert, Nov. Zool. xvii. p. 195 (1910).
a, b. ♂ ♀. Seven-Finger Mts. 13th & 14th November.

231. Chalcophaps indica (Linn.).
Ogilvie-Grant, p. 502.
a, b. ♂ ♀. Seven-Finger Mts. 15th & 16th November.

3. On the Variation of the Sea-Elephants.

By Dr. EINAR LÖNNBERG, C.M.Z.S.

[Received February 25, 1910.]

(Text-figures 55 & 56.)

Four years ago, when I wrote about the Sea-Elephant of South Georgia*, the question arose in my mind whether the Sea-Elephants inhabiting the widely separated islands in the southern subantarctic seas all belonged to one and the same race. It appeared to me most probable that this was not the case, because the herds of the different islands are, and must have been for a very considerable time, completely isolated from each other, as these animals are not pelagic in their habits, but chiefly confined to the waters surrounding the islands on the shores of which they spend a great part of their lifetime. As, however, I had not sufficient material from different localities for comparison, and the literature did not contain enough to throw satisfactory light on the matter, I had to leave it unsolved. It was therefore a great satisfaction to me when my friend Mr. R. Lydekker took up this question last year and published a paper "On the Skull-Characters in the Southern Sea Elephant."† Having read that paper, however, it appeared to me that the characters on which Lydekker has based the racial differences which, according to his views, exist between the Sea-Elephants belonging to four different geographic groups with subspecific value were rather unsatisfactory, when I considered the variation found in skulls of these animals which I had studied from material brought from South Georgia.

In the paper quoted Lydekker diagnosed the following races:—

"1. *Macrorhinus leoninus typicus*, Juan Fernandez."

"2. *M. l. falclandicus*, Falkland Islands."

"3. *M. l. macquariensis*, Macquarie and (?) Chatham Islands."

"4. *M. crosetensis*, Crozet and (?) Kerguelen and Heard Islands."

According to later information Lydekker presumes that the Sea-Elephant of Juan Fernandez belongs to the same geographic group as those known under the specific name *angustirostris*, which latter name then should "be regarded as a synonym of *leoninus*, while *falclandicus* would become the substantive name for the Southern species" (*l. c.* p. 606).

Lydekker bases the subspecific differences between the Sea-Elephants from the different islands on certain proportions and other characteristics of the skulls selected from the palatal surface. To prove the difference in proportions he quotes certain measurements in English inches from which the relations in percentages of the basal length of the skull may be reckoned, as is done below.

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* K. Sv. Vetenskaps-Akad. Handl., Bd. xl.

† Proc. Zool. Soc. 1909, pt. iii. p. 600.

	Falkland.	Macquarie.	Crozet.	Chatham.
"Basal length"........	20 ins. (= 500 mm.)	18 ins. (= 450 mm.)	16·5 ins. (= 412 mm.)	16·3 ins. (= 407 mm.)
Maximum width in percent. of basal length	75	77·7	84·8	71·8
Length of palate in ditto	55	52·7	54·5	52·1
Width of palate in ditto	36·5	35	39·3	37·4

Some of these relations thus appear at first sight to be rather different in the different animals, but before any decision can be made it is of importance to find out how constant these percentages are when a somewhat greater number of skulls are measured and compared. To obtain knowledge about this I have measured seven skulls of adult and semiadult bulls of Sea-Elephants, all of them from South Georgia. The largest of these is 3 cm. longer than Lydekker's largest skull, and the smallest 0·7 cm. shorter than his smallest skull. The material might thus be regarded as comparable. The relative dimensions of the South Georgia skulls are recorded in the accompanying table of measurements. From this it is apparent that the zygomatic width—as usual among large mammals—is subject to considerable variation, viz. from 68·3 to 79·8 per cent. of the basal length of the skull, but usually it is about 72-75 per cent. A comparison reveals, then, that with regard to this dimension three of Lydekker's specimens, representing "*M. l. falclandicus*" and "*M. l. macquariensis*," fall within the limits of variation for the Sea-Elephant of

									Quite young.		
	♂	♂	♂	♂	♂	♂	♂	♀	♂	♂	♂
Basal length of skull in mm . .	530	500	484	470	450	442	400	293	197	196	193
Zygomatic width in % of basal length	79·8	74·0	68·3	74·8	77·7	71·9	73·0	72·3	80·7	81·1	84·9
Length of palate " " "	51·3	52·8	50·8	54·0	52·4	56·5	49·5	57·3	46·7	50·5	45·0
Width " " " "	37·1	35·2	32·2	36·1	35·1	34·9	34·5	34·1	34·5	34·6	35·7
Length of interpalatine suture in % of basal length. . .	5·6	16·5	11·7	13·1	9·7	13·8	14·5	13·9	5·6	10·2	10·6
Length of premaxillaries on the palatine surface in % of basal length.	21·7	23·4	22·5	25·7	20·2	21·4	19·7	16·3	.	.	...
Width of occipital condyles in % of basal length	23·0	24·0	25·6	25·7	27·1	27·6	29·2	31·4	40·6	...	.
Width of skull at posterior edge of meatus audit. ext. in % of basal length	68·4		61·9	67·4	68·0	66·0	67·2	65·1			.
Width of skull on a level with the upper posterior premaxillary suture in % of basal length	38·3	35·0	30·9	35·5	36·8	36·0	33·2	21·6	29·9	31·6	32·1
Least frontal width of skull in % of basal length	20·5	15·8	15·0	17·2	18·6	18·5	16·2	12·2	.	..	.
Length of nasals in mm.	95	95	66	56	79	57	62	.	.	...	..
Combined width of both nasals in mm.	70	67	56	62	62	42	49	..	..	...	...

South Georgia, but one of them, that regarded as the type of "*M. l. crosetensis*," is somewhat different, showing a percentage larger than that of any of the adult skulls from South Georgia. Although a direct comparison between this Crozet Island specimen measuring 412 mm. and the quite young skull from South Georgia measuring 193 mm. (conf. the table) cannot be made, though the former is young also, it is of interest to find that the percentage expressing the relation between basal length and zygomatic width is almost the same in both, viz. 84·8 and 84·9. This depends in both cases on the shortness of the snout, which thus is a retained juvenile characteristic in the Crozet Sea-Elephant, if constant.

If we then turn our attention to the length of the palate, this measurement will be found to vary from 49·5 to 56·5 per cent. of the basal length of the skull in the seven South Georgia male skulls. The figures expressing the same relative dimension in Lydekker's specimens all fall within these limits and have thus no value as racial characteristics.

The width of the palate varies in the South Georgia skulls from 32·2 to 37·1 per cent. of the basal length. Even in this feature Lydekker's specimen from the Crozet Islands is somewhat aberrant as its corresponding percentage amounts to 39·3, thus indicating a very broad palate. In this respect the Crozet specimen does not exhibit a juvenile characteristic, for the corresponding percentages of three quite young males from South Georgia are from 34·5 to 35·7.

Among other characteristics used by Lydekker for distinguishing his races of Sea-Elephants, he mentions the length of the interpalatine suture, which he says is "long" in "*falclandicus*," "shorter" in "*macquariensis*," and "longer" again in "*crosetensis*." It must be said, however, that the shape and size of the palatine bones in the Sea-Elephants are so extremely variable that no value whatever can be laid on any character derived from them. To prove this it may be mentioned that although, as a rule, the palate ends mesially behind in a projecting tip, there are other specimens also adult in which there is quite a deep palatine notch mesially. Not only depending upon this difference but because the bones themselves vary in size, the length of the interpalatine suture becomes very variable, as direct measurements indicate. Thus in the largest of the South Georgia skulls (conf. table of measurements) the interpalatine suture was only 30 mm. but in the next 81, in the next 57, then 62, 44, 61, and 68 mm. respectively. It was thus more than 2⅔ times longer in the next largest skull than in the largest. The percentages expressing the relation between the basal length of the skull and the length of the interpalatine suture vary from 5·6 to 16·5, and not two of them agree (conf. the table). It is of interest to see that such a great variation in the size of the palatine is not only due to modifications during the growth at a somewhat advanced stage, but that already in quite young individuals a similar difference makes itself apparent to the extent that the length of the interpalatine suture in one of two equally large quite young individuals is 5·6 per cent. and in the other 10·6 per cent. of the basicranial length (conf. table of measurements).

The shape of the palate should also be different in Lydekker's "subspecies" in such a way that it ought to be "flat behind and hollowed in front" in "*falclandicus*," "markedly hollow throughout" in "*macquariensis*," and "almost flat" in "*crosetensis*." The skulls from South Georgia prove that the degree of "hollowness" is very different in different specimens. In the largest skull, for instance, the palatina are markedly less "hollow" than the maxillary region of the palate, and the lateral portions of the first mentioned bones are very strongly convex. In the second largest skull the whole palate from the posterior border is evenly and strongly vaulted. In the third largest skull the palate is much less "hollow," the palatina are almost flat and somewhat convex laterally. In the fifth largest the palatina are almost flat, but the remainder of the palate is very concave. In the sixth the palate is almost completely flat, and in the seventh it is only a little "hollow." There is thus almost every degree of "hollowness" represented among these seven skulls, and characteristics derived from such a condition cannot be of subspecific value.

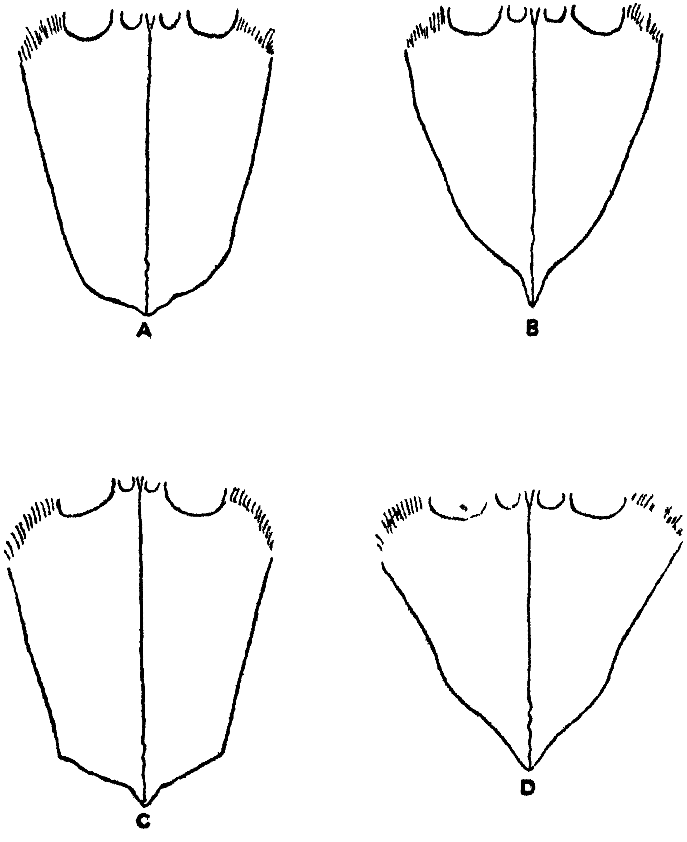
Mr. Lydekker has also used the relative length of the pterygoid processes as a distinguishing characteristic of subspecific value, saying that this process is "small" in "*falclandicus*," "longer" in "*macquariensis*," and "very slender" in "*crosetensis*." Unfortunately, the pterygoid process is subjected to just as great individual variation as other portions of the Sea-Elephant skull. As Lydekker has not recorded any direct measurements with which a comparison can be made, it may be suitable to express its relative length by measuring the distance between its posterior tip and the nearest opposite point on the bulla. This distance measures in the seven skulls from South Georgia respectively 22 mm., 10 mm., 0 mm. (in this skull the pterygoid process forms a complete bridge over to the bulla and is anchylosed with the same), 12 mm., 10 mm., 9 mm., and 4 mm. (the skulls are enumerated in the same order as in the table of measurements). As regards slenderness, the pterygoid process is always compressed and its longest diameter at the tip varies as the following measurements indicate: 10 mm., 13 mm., 15 mm., 19 mm., 15 mm., 12 mm., and 8 mm. The variability of this bone may by this be fully elucidated.

The palatal aspect of the premaxillaries is said to be **V**-shaped in "*falclandicus*" and "*macquariensis*," but **U**-shaped in "*crosetensis*." The present material from South Georgia proves that this characteristic is just as variable as the others. In the fifth and sixth of these seven skulls the **V**-shape of the palatal aspect of the premaxillaries is quite typical, but in the second and third the **U**-shape is just as pronounced as in Lydekker's figure of "*crosetensis*"; the others show intermediate features.

The accompanying figures (text-fig. 55, A–D) show this different shape of the premaxillaries in the Sea-Elephant from South

Georgia. The length of the palatine surface of the premaxillaries varies without correspondence to age or size from 19·7 to 25·7 per cent. of the basal length of the skull (conf. table of measurements).

Text-fig. 55.



Outline of palatal aspect of premaxillaries of four specimens of the Sea-Elephant from South Georgia.

Having thus examined and tried on the Sea-Elephant skulls from South Georgia all the characteristics which Lydekker regarded as satisfactory and distinctive, I have come to the conclusion that all of them are extremely variable, and, with the exception of two characteristics of "*crossetensis*," to which I shall return presently, and the width of the occipital condyles, which also will be spoken about later on, all the characteristics of Lydekker's presumed subspecies are to be found within the limits of the variation of the South Georgia Sea-Elephant. But this animal must for geographical reasons be just the one which Lydekker has named "*falclandicus*," which thus in itself unites most of the characteristics of all the others. The Sea-Elephants have long ago been exterminated on the Falkland Islands, and if now and then at the present time such an animal should be found there, it is a straying individual which has come there accidentally, most probably from South Georgia—an analogy to the fact that sometimes, although seldom, a Walrus appears at the Norwegian coast, in spite of the fact that the Walrus is as little pelagic in its habits as the Sea-Elephant.

The Sea-Elephant of the Crozet Islands Lydekker with some hesitation regards as identical with those inhabiting Kerguelen and Heard Islands. From a geographical point of view such an assumption appears quite probable. If, however, this assumption is accepted there is some material for the further consideration of the "*crosetensis*" form available in the literature, because Turner has, in his report on the Seals in the Scientific Results of the Voyage of H.M.S. 'Challenger,'* communicated a table of measurements of Sea-Elephant skulls, and among them are two male specimens from Heard Island and one male from Kerguelen Island. The lengths of the Heard Island skulls from premaxillary to occipital condyle are respectively 493 and 486 mm., and the same measurement of the Kerguelen skull is 402 mm. As the condyle has been included in these measurements the figures quoted are not directly comparable with those of the accompanying table, but by comparing the corresponding measurements of skulls at hand with the basal lengths of the same, it is easy to reckon how great a reduction is necessary to obtain the approximate basal lengths of Turner's skulls. It cannot be many millimetres wrong to assume the basal length of the Heard Island skulls to be 470 and 464 mm. respectively and that of the Kerguelen skull to be 380 mm. The measurements expressing the zygomatic width and the greatest width of the palate of these skulls are also recorded in Turner's table. If, then, the relations between these measurements and the basal length are reckoned in percentages of the latter, the following figures are obtained:—

	Heard Island.		Kerguelen.
Zygomatic width in percent. of basal length	74·4	76·2	73·9
Greatest width of palate in percent. of basal length	32·7	38·3	32·6

The three former percentages fall all of them quite well within the limits of variation found in the South Georgia skulls as quoted above; and if these specimens belong to the "*crosetensis*" form, the zygomatic width of the same is only in exceptional cases, as in Lydekker's specimen referred to above, greater than in South Georgia specimens, i. e. "*falclandicus*." The zygomatic width is consequently no distinguishing characteristic between these two.

Of the percentages expressing the relation of the width of the palate, the first and the last are rather low even for South Georgia specimens. The middle one again (38·3) is about one per cent. higher than the highest of the corresponding dimension of South Georgia specimens. From this fact and that recorded above from Lydekker's Crozet specimen only one conclusion can be drawn, that *sometimes* the Sea-Elephants of the Crozet-Kerguelen-Heard Islands geographic group have a greater palatal width than their relatives in other places so far as is known. It is not, however, a general rule and thus no distinguishing characteristic.

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* Zoology, vol. xxvi. p. 6.

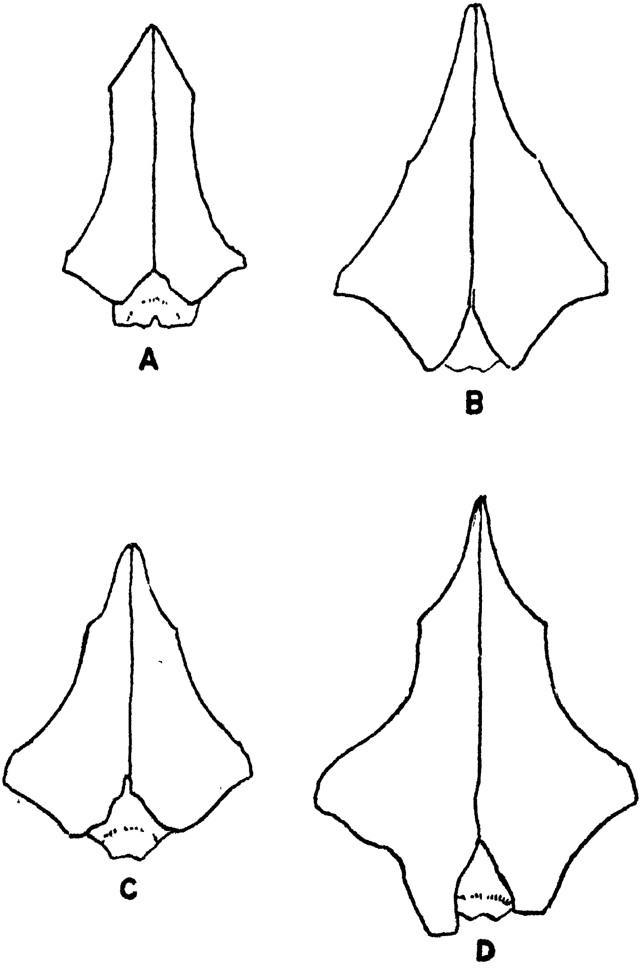
With regard to other measurements also, the relative dimensions of the skulls from Kerguelen and Heard Islands measured by Turner vary within the same limits as the corresponding figures of South Georgia skulls. As an example may be mentioned that the width of the skull at the posterior edges of *meatus auditorius externus* is in the South Georgia skulls from 61·9 to 68·4 per cent. of the basal length (conf. table of measurements), while the corresponding measurements of Turner's skulls are respectively 64·4, 61·2, and 66·8. These latter measurements do not indicate any greater width of the skull than the corresponding figures of South Georgia skulls.

Another example indicating a similar condition is obtained by comparing the width of the maxillary portion of the skull with the basal length. In this case I have measured the South Georgia skulls on a level with the upper posterior premaxillary suture. The percentages expressing this relation (conf. table of measurements) vary in the adult and semiadult males from 30·9 to 38·3 per cent., without corresponding with the size or age of the animals. With the above measurements may correspond fairly well those recorded by Turner as indicating the "width of maxilla across middle of rostrum" of Heard Island and Kerguelen specimens. If these then are compared with the basal length of the skulls (conf. above), the following percentages are obtained (enumerated in the same order as before): 34·0, 36·4, and 32·1. All these fall evidently within the limits of variation of the South Georgia material, and they do not at all indicate any greater relative width of this portion of the skull in the Heard-Kerguelen animals than in those from South Georgia.

In Turner's table of measurements there are some figures indicating the "smallest interfrontal width." As I do not know whether this measurement coincides with the least frontal width according to my way of measuring, I cannot make any direct comparison, but only quote the percentages obtained. In the South Georgia material there is a variation from 15·0 to 20·5, but the percentages reckoned from Turner's figures are respectively 15·1, 14·0, and 13·6, thus lower than the former. If Turner's and my own measurements really coincide, as I believe they do, the percentages appear to indicate a narrower forehead in the Heard-Kerguelen Sea-Elephants.

The measurements hitherto considered show very plainly a quite irregular variation which does not correspond with size or age. But there is another relative dimension which exhibits a very beautiful series (conf. the table of measurements) in full correspondence with the size of the skull, and that is the width of the occipital condyles compared with the basal length of the skull.

Text-fig. 56.



Outline of the nasals of four specimens of the Sea-Elephant from South Georgia.

This percentage decreases regularly and gradually from the skull of the quite young animal to that of the oldest bull. Considering this fact, it is perhaps of importance that Lydekker states that the condyles of his "*crossetensis*" are "extremely narrow." To judge from his figure (*l. c.* p. 605) the condyles of the Crozet skull appear to be only about 20 per cent. of the basal length of the skull, although the latter measurement is said to be "16·5 ins." or 412 mm. According to the condition observed in the material from South Georgia, the condyles of such a small skull ought to have been something about 28 per cent. of the basal length. It is possible that this characteristic together with others—but hardly those discussed above—might prove that a racial difference exists in the geographic group represented by the Crozet skull. It is, however, difficult to base any opinion about this on a single skull when these animals have proved so extremely variable in their skull characters. Unfortunately, Turner has not communicated any measurements of the condyles of his skulls from Heard Island and Kerguelen Island.

The Sea-Elephant skulls from South Georgia show a quite irregular variation in many other respects than those already mentioned. The general shape of the nasals is, for instance, very variable as the accompanying four figures (text-fig. 56 A-D, p. 587) prove. The dimensions are also extremely different in different specimens with regard to length as well as to width, as may be seen from the table of measurements. The mesethmoid reaches the upper surface of the skull and fills up the mesial anterior notch between the nasals, where it expands more or less in different specimens as the figures of the nasals show. By this a continued growth forward and ossification of the nasals in the mesial line is made impossible, but on either side of the mesethmoideum there is free space enough for such a growth and this might contribute to the irregular shape of the nasals.

The exceedingly great variation of the Sea-Elephant skulls appears to be fully proved by these notes, and it must certainly be regarded as a very interesting fact. This great variation is partly explained by the general rule that large mammals, the growth of which is continued through a long period of years, each of which contains different seasons with different conditions of life, are more apt to vary than such as conclude their growth within one year. Another factor which also may be of some importance in this connection is that the Sea-Elephants originally had hardly any dangerous foes which could influence a natural selection. Now, however, these very interesting and completely harmless sea-monsters have been unfortunate enough to provoke the most dangerous of all foes—the greediness of man; and by this they are threatened with extinction even in the few remote places where they may still exist in limited numbers. Indeed, the Southern Sea-Elephant is doomed to share the sad fate of its Californian relative if speedy measures are not taken for its protection. The hope of zoologists and all friends of living nature is that the the Government of Great Britain may give this protection which is so sorely needed.

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No. 77.

ABSTRACT OF THE PROCEEDINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.*

January 18th, 1910.

Prof. J. Rose Bradford, M.D., D.Sc., F.R.S., Vice-President, in the Chair.

The Minutes of the last Scientific Meeting were confirmed.

The Secretary read a Report on the additions that had been made to the Society's Menagerie during the month of December 1909.

Mr. C. W. Beebe, Curator of Birds of the New York Zoological Society, exhibited a series of lantern-slides made from photographs he had taken on a recent Natural History Expedition to British Guiana.

Mr. S. A. Neave, M.A., B.Sc., F.Z.S., communicated a paper on the Collections of Butterflies made by him during four years spent in Northern Rhodesia and adjacent territories. The collection comprised 450 species, of which 30 were new to science, besides several rare and little-known species, including the rare *Acræa mirifica* Lathy and the hitherto unknown female.

Mr. J. T. Cunningham, M.A., F.Z.S., read a paper on the Marine Fishes and Invertebrates of St. Helena, containing the scientific results of a visit which he had made to the island in February and March 1909, in company with, and at the invitation of, Alfred Mosely, Esq., C.M.G., for the purpose of investigating the condition and prospects of the fisheries of the island. Mr. Cunningham's Report on the results of the investigation from the economic point of view had been presented to the Colonial Office. The Invertebrates collected had been examined and identified by specialists of the Natural History Museum—namely, Dr. Calman, Mr. Edgar Smith, Prof. Jeffrey Bell, and Mr. Kirkpatrick, the last-named having described a new species of Sponge and a new Hydroid. The Fishes had been worked out by Mr. Cunningham himself, and included two new species, one belonging to the Stromateidæ and one to the Cyphosidæ. The three kinds of Albacore occurring at St. Helena were shown to be identical with the three species diagnosed at Madeira by the Rev. R. T. Lowe in 1839, namely, *Thynnus alalonga*, *T. albacora*, and *T. obesus*, species which had been confused or rejected by recent ichthyologists; the synonymy and distribution of these were for the first time correctly elucidated.

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* This Abstract is published by the Society at 3 Hanover Square, London, W., on the Tuesday following the date of Meeting to which it refers. It will be issued, along with the 'Proceedings,' free of extra charge, to all Fellows who subscribe to the Publications; but it may be obtained on the day of publication at the price of *Sixpence*, or, if desired, sent post-free for the sum of *Six Shillings* per annum, payable in advance.

The paper was illustrated by lantern-slides from photographs of the larger fishes and of the scenery of St. Helena.

Dr. H. G. PLIMMER, F.L.S., F.Z.S., Pathologist to the Society, reported on the Deaths which occurred in the Society's Gardens during 1909, and illustrated his remarks with a series of lantern-slides.

Dr. W. T. CALMAN, F.Z.S., presented the second and concluding part of a Report on New or Rare Crustacea of the Order CUMACEA, from the collection of the Copenhagen Museum. This portion of the Report dealt with the families NANNASTACIDÆ and DIASTYLIDÆ, and 27 species were described, all of which were regarded as new, and 3 new genera were established. This communication will be published in the 'Transactions.'

The SECRETARY communicated a paper by Prof. W. M. SMALLWOOD, of Syracuse University, New York, U.S.A., on the Hydroids and Nudibranchs of Bermuda.

The next Meeting of the Society for Scientific Business will be held on Tuesday, the 1st February, 1910, at half-past Eight o'clock P.M., when the following communications will be made:—

1. The Hon. PAUL A. METHUEN.

On a Collection of Freshwater Crustacea from the Transvaal.

2. Dr. JOSEPH PEARSON, F.L.S.

(*a*) Littoral Marine Fauna: Kerimba Archipelago, Portuguese East Africa, collected by Jas. J. Simpson, M.A., B.Sc., University of Aberdeen. Sept. 1907 to May 1908 HOLOTHURIOIDEA.

(*b*) Marine Fauna: Mergui Archipelago, Lower Burma, collected by Jas. J. Simpson, M.A., B.Sc., and R. N. Rudmose-Brown, B.Sc., University of Aberdeen. HOLOTHURIOIDEA.

3. Dr. G. STEWARDSON BRADY, LL.D., D.Sc., F.R.S., C.M.Z.S.

A Revision of the British Species of Ostracoda belonging to the Subfamilies CANDONINÆ and HERPETOCYPHRIDINÆ.

The following communications have been received:—

1. ROWLAND E. TURNER, F.Z.S., F.E.S.

Additions to our Knowledge of the Fossorial Wasps of Australia.

2. HAMILTON H. DRUCE, F.L.S., F.Z.S.

Descriptions of new LYCÆNIDÆ and HESPERIIDÆ from Tropical West Africa.

3. J. LEWIS BONHOTE, M.A., F.L.S., F.Z.S.

On the Varieties of *Mus rattus* in Egypt, with General Notes on the Species having reference to Variation and Heredity.

4. C. L. BOULENGER, M.A., F.Z.S.

On certain Subcutaneous Fat-Bodies in Toads of the Genus *Bufo*.

5. F. E. BEDDARD, M.A., F.R.S., F.Z.S.

A Contribution to the Anatomy of *Hippopotamus amphibius*.

Communications intended for the Scientific Meetings of the Zoological Society of London should be addressed to

P. CHALMERS MITCHELL,
Secretary.

3 Hanover Square, London, W.
January 25th, 1910.

No. 78.

ABSTRACT OF THE PROCEEDINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.*

February 1st, 1910.

Prof. E. A. MINCHIN, M.A., Vice-President,
in the Chair.

The Minutes of the last Scientific Meeting were confirmed.

Mr. CHARLES A. DARLING, General Manager of the British New Guinea Development Co., exhibited a mounted specimen of a Cuscus (*Phalanger maculatus*). The animal had been captured in New Guinea and brought to England alive, but had subsequently died, and was to be presented to the British Museum (Natural History) by its owner, Mr. D. Elliot Alves. Mr. Darling called attention to the soft white fur with brown spots and the prehensile tail, and stated that when the living animal was asleep in daylight the eyes remained open with the pupils fully contracted.

The SECRETARY read a letter from Captain J. A. M. VIPAN, F.Z.S., which suggested that the probable cause of the immense numbers of the freshwater Cyprinodont fishes known as "Millions" (*Girardinus pœciloides*) in Barbados, and their consequent agency in suppressing malaria by destroying mosquito larvæ, was the absence of other freshwater fishes in that island. The writer added that in his opinion there was no specific distinction between *G. pœciloides* and *G. guppii* of Trinidad, and that *Pœcilia reticulata* Peters, of Venezuela, was the same fish. The presence of other freshwater fishes in these localities prevented extensive multiplication of these small fishes, with the result that they had no effective action in keeping down mosquitoes.

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The **Secretary**, on behalf of Col. Sir A. H. **McMahon**, K.C.I.E., C.S.I., F.Z.S., exhibited some specimens of the Cicada (*Sena quærula*) collected at Quetta, Baluchistan, which had been visited with great swarms of these insects in 1909. Similar swarms had been known to occur at intervals of about six years. The Cicada bores a hole in the ground, apparently intended merely to hold the insect during its pupa stage. Each hole is separate and quite open, holds only one pupa, and is bored vertically to a depth varying from 11 inches to 2 feet. In diameter it is about half an inch, but widens slightly at the bottom.

Dr. R. T. **Leiper**, F.Z.S., exhibited a series of specimens of Entozoa, viz.:—

(*a*) A sexually mature Guinea-worm (*Dracunculus medinensis*) that had recently been found by Mr. Charles Grey in a Leopard at Broken Hill, N.W. Rhodesia. Guinea-worm is normally a parasite of man, but very occasionally it attacks horses and dogs. This is the first record of its occurrence in the Leopard. The discovery of the parasite in Rhodesia is also of considerable interest for the Equator forms the southern limit of the endemic area of the disease amongst the natives of Africa.

(*b*) A Nematode from the body-cavity of the Tsetse-fly (*Glossina palpalis*), found by Dr. A. Gray, R.A.M.C., at Entebbe. The specimen, 3 inches in length, is an immature female *Mermis*.

(*c*) A series of round worms from horses that had lived in London for several years. The specimens included:—*Ascaris megalocephala*, *Oxyuris curvula*, *Strongylus equinus*, *Strongylus edentatus*, *Strongylus vulgaris* (developmental forms of this worm causing aneurisms of the abdominal aorta), *Triodontophorus serratus*, *Gyalocephalus capitatus*, *Cylichnostomum elongatum*, *Cylichnostomum* sp. n. The *Sclerostomum tetracanthum* Mehlis was absent. The parasites were present in considerable numbers, and it seemed evident that they reached London as semi-dried larvæ encysted upon hay.

Dr. **Leiper** also gave an account of the Entozoa of *Hippopotamus amphibius*, collected by him in Uganda in 1907, when a member of the Egyptian Government Survey.

The Hon. **Paul A. Methuen** read a paper "On a Collection of Freshwater Crustacea from the Transvaal," communicated by Prof. G. C. **Bourne**, D.Sc., F.Z.S., containing an account of some Entomostraca collected from Lake Chrissie and other pans or lakes in the Carolina District, which is high veldt country lying near the borders of Swaziland. The paper also gave a short description of the "lie" of the lake and notes on the geology of the district and the composition of the water.

Dr. **Joseph Pearson**, F.L.S., presented two papers, communicated by Prof. W. N. **Parker**, Ph.D., F.Z.S., on **Holothurioidea** from the Kerimba Archipelago, Portuguese East Africa, and from the Mergui Archipelago, Lower Burma. The collection from the Kerimba Archipelago contained 21 species, all of which had been previously described. In this paper it is proposed to establish a new genus for the inclusion of *Colochirus violaceus* Théel. The collection from the Mergui Archipelago called for no special comment, none of the 14 species being new.

Dr. G. **Stewardson Brady**, LL.D., F.R.S., C.M.Z.S., presented a paper entitled "A Revision of the British Species of Ostracoda belonging to the Subfamilies CANDONINÆ and HERPETOCYPHRIDINÆ." The paper was a synopsis intended to show our present knowledge of the families referred to, describing briefly the known British species. Some few new genera and species, and others already described by foreign authors but not previously recognized as British, were dealt with.

Mr. **Frank E. Beddard**, M.A., F.R.S., F.Z.S., read a paper "On the Anatomy of *Hippopotamus amphibius*," based on a male specimen which had died in the Society's Gardens.

The next Meeting of the Society for Scientific Business will be held on Tuesday, the 15th February, 1910, at half-past Eight o'clock P.M., when the following communications will be made:—

1. Kinematograph Demonstration, by courtesy of Mr. Charles Urban, F.Z.S.

   The Society's Animal Collection kinematographed for the first time in their Natural Colours by the Urban-Smith process known as "Kinemacolor." Also a new series of Studies in Monochrome kinematographed during the Summer of 1909.

2. **Rowland E. Turner**, F.Z.S., F.E.S.

   Additions to our Knowledge of the Fossorial Wasps of Australia.

3. **Hamilton H. Druce**, F.L.S., F.Z.S.

   Descriptions of new LYCÆNIDÆ and HESPERIIDÆ from Tropical West Africa.

4. **C. L. Boulenger**, M.A., F.Z.S.

   On certain Subcutaneous Fat-Bodies in Toads of the Genus *Bufo*.

The following communications have been received :—

1. J. Lewis Bonhote, M.A., F.L.S., F.Z.S.
   On the Varieties of *Mus rattus* in Egypt, with General Notes on the Species having reference to Variation and Heredity.

2. Sir George F. Hampson, Bart., F.Z.S.
   Zoological Collections from Northern Rhodesia and Adjacent Territories: Lepidoptera Heterocera.

Communications intended for the Scientific Meetings of the Zoological Society of London should be addressed to

P. CHALMERS MITCHELL,
Secretary.

3 Hanover Square, London, W.
February 8*th*, 1910.

No. 79.

ABSTRACT OF THE PROCEEDINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.*

February 15th, 1910.

Dr. S. F. HARMER, M.A., F.R.S., Vice-President,
in the Chair.

The Minutes of the last Scientific Meeting were confirmed.

The SECRETARY read a Report on the additions that had been made to the Society's Menagerie during the month of January 1910.

Mr. JAMES F. OCHS, F.Z.S., exhibited twelve heads of Wapiti, *Cervus canadensis typicus*, obtained by Mr. A. Williamson in 1879 on the Piney Range, Rocky Mountains, and the head of a Bison, *Bos bison*, which formed part of a collection of hunting trophies that had been presented to the Royal Automobile Club by Mr. Williamson.

The following are the measurements in inches of the horns of the five largest Wapiti heads:—

Points	13	16	14	12	16
Length	59, 59½	56, 59	54, 55½	54, 54½	52, 53
Span	50	51	45	42	51
Girth round burr	13	15¼	12	12¾	12½
Girth above burr	10½	12½	10¼	11¼	10½

Mr. CHARLES URBAN, F.Z.S., Managing Director of the Natural Colour Kinematograph Co., Ltd., gave a display of motion pictures of animals which had been exhibited hitherto in this country only before T.M. The King and Queen at Knowsley, the Society of Arts, and the Palace Theatre, London. The pictures had been taken, with one or two exceptions, at the Society's Gardens in Regent's Park, and at the National Zoological Park, Washington, U.S.A. Mr. John Mackenzie, the expert who had photographed the animals, introduced and explained the series and the processes which had been employed in obtaining them.

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The coloured pictures obtained by the Urban-Smith system of Kinemacolor were particularly successful in reproducing faithfully various shades of yellow, grey, and brown, the films exhibiting the Giraffes feeding and the Elephants bathing being strikingly good, whilst some of the brightly coloured birds were extremely interesting. A series of uncoloured films gave faithful and pleasing representations of various animals in movement, some of them displaying the effect on the animals of gramophone music.

Mr. Rowland E. Turner, F.Z.S., F.E.S., read a paper entitled "Additions to our Knowledge of the Fossorial Wasps of Australia." Many new species were therein described, belonging chiefly to the Families Thynnidæ and Ceropalidæ. The Thynnidæ had been collected chiefly by Mr. H. M. Giles in South-western Australia, and many interesting notes had been contributed by him on their habits. The sexual differences were extreme, and hitherto few Western Australian species had been correctly paired. The females were wingless, and the mouth-parts extremely minute, so that only liquid food could be taken, and this was usually disgorged by the male and placed in the mouth of the female. Mr. Giles had observed several cases of cross pairing, in which the male was carrying the female of a different species; there could be no doubt as to the accuracy of this observation, though it was possible that the male claspers might be used for carrying the female when coupling did not take place.

The geographical distribution of the genus *Anthobosca* (Fam. Scoliidæ), now almost entirely confined to the Southern Hemisphere, was also discussed.

Mr. Hamilton H. Druce, F.L.S., F.Z.S., presented a paper entitled "Descriptions of new Lycænidæ and Hesperiidæ from Tropical South Africa," which contained an account of the numerous new forms collected by Mr. G. L. Bates, F.Z.S., on the Ja River, Cameroons, and by Herr Landbeck in the Upper Kasi district of the Congo. The author stated that until recently it had been almost impossible to identify many Lycænidæ described from this region by Dr. Karsch and by Herr Suffert without visiting the Imperial Museum at Berlin, where the types were deposited, but that by the kindness of the Director he had been able to obtain about forty excellent photographs of these, which he was on the point of publishing on eight plates.

The Secretary, on behalf of Mr. C. L. Boulenger, M.A., F.Z.S., presented a paper entitled "On certain Subcutaneous Fat-Bodies in Toads of the Genus *Bufo.*" In *Bufo viridis*, of which the author had examined fresh material, these fat-bodies were very well developed, and on reflecting the skin from the ventral surface, one noticed a pair of gland-like fatty structures at the junction of the hind limbs with the trunk. They were present in both sexes, and varied considerably in size and colour in different individuals, but were quite constant in position.

The next Meeting of the Society for Scientific Business will be held on Tuesday, the 1st March, 1910, at half-past Eight o'clock p.m., when the following communications will be made:—

[illegible] *J. Lewis Bonhote, M.A., F.L.S., F.Z.S.*
On the Varieties of *Mus rattus* in Egyyt, with General Notes [illegible]he Species having reference to Variation and Heredity.

2. Si[illegible]orge F. Hampson, Bart., F.Z.S.
Zoological Collections from Northern Rhodesia and Adjacent Territories: Lepidoptera Heterocera.

3. T. H. Burlend, M.A., B.Sc.
The Urogenital Organs of *Chimæra monstrosa.*

The following communications have been received:—

1. R. H. Whitehouse, M.Sc.
The Caudal Fin of the Teleostomi.

2. T. Goodey, M.Sc.
A Contribution to the Skeletal Anatomy of *Chlamydoselachus anguineus*, Garman.

Communications intended for the Scientific Meetings of the ZOOLOGICAL SOCIETY OF LONDON should be addressed to

P. CHALMERS MITCHELL,
Secretary.

3 HANOVER SQUARE, LONDON, W.
February 22nd, 1910.

No. 80.

ABSTRACT OF THE PROCEEDINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.*

March 1st, 1910.

Dr. A. SMITH WOODWARD, F.R.S., Vice-President, in the Chair.

The Minutes of the last Scientific Meeting were confirmed.

The SECRETARY exhibited photographs of a Thylacine (*Thylacinus cynocephalus*) and three cubs which had been sent him by Mrs. Mary G. Roberts, C.M.Z.S., of Hobart, Tasmania. Mrs. Roberts had informed him by letter that the Thylacines had been in her possession for about eight months, and were tame and playful, and that the mother had nursed them until they were nearly as large as herself, although throughout that time they had also taken raw meat. Mrs. Roberts added that the Thylacine had extremely strong maternal instincts and that these animals, in her opinion, were not of low intelligence.

The SECRETARY called attention to the recently published 'Camera Adventures in the African Wilds,' by A. Radclyffe Dugmore, remarking on the great additions to knowledge of wild animals that were being obtained by this new form of sport. He directed special attention to the photographs of Grèvy's Zebra, obtained near the Guaso Nyiro River, not far from Mt. Kenia, as evidence of the range of that species, and to an extremely interesting photograph of the Giant Bush-Pig (*Hylochœrus meinertzhageni*) taken in the same locality.

Mr. R. H. BURNE, F.Z.S., exhibited a preparation of the vena cava inferior, diaphragm, and liver from a Seal (*Phoca vitulina*) that had recently been living in the Gardens. The specimen

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showed the strong sphincter muscle (derived from the diaphragm) that encircles the lower end of the thoracic segment of the vena cava, the great dilatation of this vessel below the diaphragm and within the liver, and the presence of a pair of venous plexuses in connection with the cava midway between the diaphragm and the heart.

Mr. **Frank E. Beddard**, M.A., F.R.S., F.Z.S., Prosector to the Society, exhibited a series of specimens of Earthworms from Luzon, Philippine Islands.

Dr. C. W. **Andrews**, F.R.S., F.Z.S., exhibited and made remarks upon some teeth of *Elephas* (*Stegodon*) *insignis* and of a species of horse from China. The former were from Sze-chuen, probably from beds of Lower Pliocene age, and were sent to the British Museum by the Rev. W. C. Taylor, of the China Inland Mission. The horse teeth were from Tsi-shan, N. China, from a depth of about 300 feet in the Loess, probably of Pleistocene age: these were sent by the Rev. R. Gillies, also of the China Inland Mission.

Dr. R. T. **Leiper**, F.Z.S., exhibited the larval stage of *Trichostrongylus pergracilis*, the causal factor of Grouse disease. He found experimentally that the development follows almost exactly the same course as that of Ankylostome—the cause of miner's disease in Cornwall. The egg developed into embryos in about two days, and metamorphosed on the eighth day into a peculiarly active larva that climbed heather only in wet weather. These larvæ were found in extraordinary numbers on the plants, the roots of which were experimentally infected. Subsequent drying did not kill the larvæ, for by encysting they could survive several weeks without additional moisture, but were unable, however, to resist desiccation. They underwent no further developmental change, and this stage, when fed to healthy Grouse, alone was able to produce infection, and within four days eggs were found in the droppings.

Dr. Leiper also exhibited a specimen of *Cyclops* containing a living embryo of *Cucullanus elegans*, a blood-sucking parasite of Perch, and discussed the mode of entry into *Cyclops* of this worm and the guinea-worm. Experiments showed that the embryos only penetrated living Cyclopidæ, and led to the conclusion that the *Cyclops* actually swallowed the living embryos and these penetrated the stomach.

The paper by Mr. J. **Lewis Bonhote**, M.A., F.L.S., F.Z.S., "On the Varieties of *Mus rattus* in Egypt, with General Notes on the Species having reference to Variation and Heredity," announced for this evening's Meeting, was postponed owing to the unavoidable absence of the Author.

Sir **George F. Hampson**, Bt., F.Z.S., presented a paper giving a list of the Moths collected by Mr. Sheffield A. Neave, F.Z.S., in Rhodesia north of the Zambesi and the adjacent Katanga District of the Congo Free State, nearly two hundred new species being described.

The Moth fauna of the district is mainly of a West African type, with a considerable admixture of East African and Mashonaland forms. As there are no high ranges of mountains or deep river valleys the fauna presents a very uniform tropical African character, with no high mountain forms or forms peculiar to the faunas of the drier parts of Southern or Northern Africa.

The **Secretary** read a paper on "The Urogenital Organs of *Chimæra monstrosa*," by T. H. **Burlend**, M.A., B.Sc., communicated by Prof. W. N. **Parker**, Ph.D., F.Z.S.

This paper dealt with the urogenital organs of *Chimæra*, both immature and adult of each sex. Much of the early work of Leydig and Hyrtl, which later writers had ignored or disputed, was now confirmed and supplemented. The kidney of the young male became differentiated at maturity into an anterior portion, the "Leydig's gland," with a function like that of the prostate gland of higher vertebrates, and a posterior portion, which retained its urinary function. Concomitant changes occurred in the structure of the sperm-duct. Vasa efferentia were present in the male, and these passed directly into a collector with which the sperm-duct was continuous; hence an epididymus, as usually defined, was absent. The adult female was shown to lose the distinct urogenital sinus found in the young animal; further, the term "digitiform gland" was suggested as more suitable for the structure usually called the "receptaculum seminis."

The next Meeting of the Society for Scientific Business will be held on Tuesday, the 15th March, 1910, at half-past Eight o'clock P.M., when the following communications will be made:—

1. T. **Goodey**, M.Sc.

A Contribution to the Skeletal Anatomy of *Chlamydoselachus anguineus* Garman.

2. Prof. Dr. **Einar Lönnberg**, C.M.Z.S.

On the Variation of the Sea-Elephants.

3. **F. E. Beddard, M.A., F.R.S.**

On the Alimentary Tract of certain Birds, and on the Mesenteric Relations of the Intestinal Loops.

The following communications have been received :—

1. **R. H. Whitehouse, M.Sc.**

The Caudal Fin of the Teleostomi.

2. **Prof. G. O. Sars, C.M.Z.S.**

Zoological Results of the Third Tanganyika Expedition, conducted by Dr. W. A. Cunnington, F.Z.S., 1904–1905.—Report on the Ostracoda.

3. **Stanley Kemp, B.A.**

Notes on the Photophores of Decapod Crustacea.

4. **J. Lewis Bonhote, M.A., F.L.S., F.Z.S.**

On the Varieties of *Mus rattus* in Egypt, with General Notes on the Species having reference to Variation and Heredity.

Communications intended for the Scientific Meetings of the Zoological Society of London should be addressed to

P. CHALMERS MITCHELL,
Secretary.

3 Hanover Square, London, W.
March 8th, 1910.

No. 81.

ABSTRACT OF THE PROCEEDINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.*

March 15th, 1910.

E. T. Newton, Esq., F.R.S., in the Chair.

The Minutes of the last Scientific Meeting were confirmed.

The Secretary read a Report on the additions that had been made to the Society's Menagerie during the month of February 1910.

The Secretary read an account of some post-mortem phenomena observed by Mr. E. W. Shann, B.Sc., in a specimen of *Lemur fulvus rufifrons* which died recently in the Zoological Gardens at Giza, Egypt.

Mr. Oldfield Thomas, F.R.S., F.Z.S., exhibited the skin of a new Potto from British East Africa, which was proposed to be called

Perodicticus ibeanus, sp. n.

Fur very thick and soft. Colour of upper surface grizzled hoary grey, except the shoulders and fore-back, which were blackish. Teeth comparatively small.

Head and body 339 mm.; tail 68; skull 64.

Hab. Kakamega Forest, British East Africa.

Type. Male. B.M. no. 10.3.18.1. Presented by Messrs. Matison and Brett.

Mr. D. Seth-Smith, F.Z.S., Curator of Birds, gave an account of some living examples, in the Society's Gardens, of the Black-hooded Parrakeet (*Psephotus cucullatus*).

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The SECRETARY read a letter from Mr. George Jennison, of the Manchester Zoological Gardens, giving an account of the successful breeding of Pine-Snakes in confinement.

Mr. CHARLES SILLEM exhibited some living specimens of the Crustacean *Chirocephalus diaphanus* recently caught in a flooded ditch on Eton Wick Common.

Mr. T. GOODEY, M.Sc.(Birm.), introduced by the Secretary, gave an account of his Memoir entitled "A Contribution to the Skeletal Anatomy of the Fish *Chlamydoselachus anguineus*, Gar."

The Author dealt with the anatomy of the axial and appendicular skeleton, paying particular attention to the structure of the notochord. He stated that the notochord in this fish had generally been regarded as unconstricted except at the extreme anterior extremity, but that he had ascertained the presence of well-developed, calcified cyclospondylic centra at the anterior end of the column and of calcified cyclospondylic centra of two sizes in the main caudal region.

Mr. W. R. OGILVIE-GRANT, F.Z.S., read a paper entitled "Additional Notes on the Birds of Hainan," based on a small collection of Hainan birds recently forwarded to the Zoological Society by Mr. Robert Douglas, of Shanghai, and, at the suggestion of Dr. Chalmers Mitchell, F.R.S., presented to the Natural History Museum. The collection contained several species of great interest, and the two following were described as new:—

TEPHRODORNIS HAINANUS, sp. n.

Adult male. Differs from Indian examples of *T. pelvicus* Hodgs. in having the mantle and back much darker and of a reddish-brown colour.

Adult female. Darker and browner above than the female of *T. pelvicus* Hodgs.

Hab. Seven-Finger Mountains.

PITTA DOUGLASI, sp. n.

Adult male. Most nearly allied to *P. soror*, Wardlaw Ramsay, from Cochin China, which it resembles in having the crown and occiput dull bluish-green like the back, lower back and rump bluish; the fore part of the head, cheeks, ear-coverts, and lower part of the throat dull pink, chin inclining to whitish, lores, feathers surrounding the eye and on either side of the occiput rust-red; chest very similar but tinged with pink; breast and rest of underparts buff; lower part of the abdomen whitish, upper wing-coverts and scapulars greenish-blue like the mantle; quills brown, margined on the outer web, especially towards the extremity, with pale brownish-buff, the five outer primaries white at the base of the inner web; tail greenish-blue like the back.

Total length ca. 8·0 inches; wing 4·45; tail 2·05; tarsus 2·0.

Adult female. Differs from the male in being less brightly coloured; the top of the head, occiput, and nape being olive-brown suffused with pink, and the rest of the upperparts, including the wing-coverts and scapulars, mostly dull olive-green; the chest buff (instead of rust-red) tinged with pink, and the rest of the underparts paler buff.

Total length ca. 7·6 inches; wing 4·4; tail 1·9; tarsus 1·8.

Hab. Seven-Finger Mountains.

Among the rarities attention was called to the remarkable Magpie (*Temnurus niger*) with its curious truncate tail-feathers, the beautiful Green Jay (*Cissa katsumatæ*) recently described by the Hon. Walter Rothschild, F.Z.S., and a Bulbul (*Pycnonotus sinensis*) not hitherto recorded from the island.

The SECRETARY communicated a paper by Dr. EINAR LÖNNBERG, C.M.Z.S., "On the Variation of the Sea-Elephants."

The next Meeting of the Society for Scientific Business will be held on Tuesday, the 5th April, 1910, at half-past Eight o'clock P.M., when the following communications will be made:—

1. F. E. BEDDARD, M.A., F.R.S.

On the Alimentary Tract of certain Birds, and on the Mesenteric Relations of the Intestinal Loops.

2. R. H. WHITEHOUSE, M.Sc.

The Caudal Fin of the Teleostomi.

3. T. M. S. ENGLISH.

Some Notes on Tasmanian Frogs.

The following communications have been received:—

1. Prof. G. O. SARS, C.M.Z.S.

Zoological Results of the Third Tanganyika Expedition, conducted by Dr. W. A. Cunnington, F.Z.S., 1904–1905.—Report on the Ostracoda.

2. **Stanley Kemp, B.A.**

Notes on the Photophores of Decapod Crustacea.

3. **J. Lewis Bonhote, M.A., F.L.S., F.Z.S.**

On the Varieties of *Mus rattus* in Egypt, with General Notes on the Species having reference to Variation and Heredity.

4. **G. E. Bullen.**

On an Example of Posterior Dichotomy in an Aylesbury Duckling.

5. **Dr. R. Broom, D.Sc., C.M.Z.S.**

On *Tritylodon*, and on the Relationships of the Multituberculata.

6. **D. G. Lillie, B.A.**

Observations on the Anatomy and General Biology of some Members of the larger Cetacea.

Communications intended for the Scientific Meetings of the Zoological Society of London should be addressed to

P. CHALMERS MITCHELL,
Secretary.

3 Hanover Square, London, W.
March 22*nd*, 1910.

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